GB
1025
T4T3

Water-Supply and Irrigation Paper No. 190 Series 0, Underground Waters, 67

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

UNDERGROUND WATERS OF COASTAL PLAIN OF TEXAS

BY
THOMAS U. TAYLOR

WASHINGTON
GOVERNMENT PRINTING OFFICE
1907

Class GB1025
Book .T4T3

161

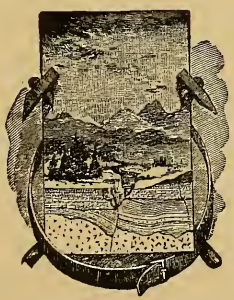
Water-Supply and Irrigation Paper No. 190 Series 0, Underground Waters, 67

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

670

UNDERGROUND WATERS OF COASTAL PLAIN OF TEXAS

BY
THOMAS U. TAYLOR



WASHINGTON
GOVERNMENT PRINTING OFFICE
1907

MAY 21 1907
D. of D.

CONTENTS.

	Page.
Introduction	1
Area covered	1
Sources of data	1
Geography of the region	1
General statement	1
Topography	2
Drainage	2
Geology	2
Underground waters, by counties	2
Cameron County	3
Hidalgo County	7
Starr County	8
Nueces County	9
San Patricio County	13
Refugio County	13
Aransas County	14
Calhoun County	14
Victoria County	15
Jackson County	16
Matagorda County	19
Wharton County	19
Brazoria County	21
Fort Bend County	24
Harris County	24
Galveston County	27
Chambers County	30
Jefferson County	31
Orange County	32
Zapata County	33
Duval County	33
Live Oak County	33
Bee County	34
Goliad County	34
Karnes County	34
Dewitt County	34
Gonzales County	35
Lavaca County	38
Fayette County	39
Colorado County	39
Austin County	41
Waller County	41
Washington County	41
Grimes County	42

Underground waters, by counties—Continued. Page.
Liberty County 43
Montgomery County 44
Walker County 46
San Jacinto County 46
Polk County 46
Hardin County 47
Tyler County 48
Jasper County 48
Newton County 50
Webb County 50
Maverick County 51
Dimmit County 51
Zavalla County 52
Lasalle County 53
McMullen County 53
Frio County 54
Atascosa County 55
Bexar County 55
Wilson County 57
Guadalupe County 57
Caldwell County 57
Bastrop County 58
Lee County 58
Robertson County 58
Milam County 59
Burleson County 60
Brazos County 61
Madison County 62
Leon County 62
Freestone County 63
Houston County 63
Anderson County 63
Limestone County 63
Cherokee, Trinity, Angelina, San Augustine, and Sabine counties 63
Nacogdoches County 64
Shelby, Panola, and Rusk counties 65
Van Zandt and Rains counties 65
Smith County 66
Wood and Gregg counties 66
Upshur County 67
Harrison County 67
Marion County 67

ILLUSTRATIONS.

Page.
PLATE I. *A*, A typical artesian well in the Texas Coastal Plain; *B*, Artesian well 4 miles south of Pearsall, Tex 1
II. Map showing location of artesian wells in the Texas Coastal Plain 2
III. Artesian wells in Rio Grande embayment 6

A. A TYPICAL ARTESIAN WELL IN THE TEXAS COASTAL PLAIN.

B. ARTESIAN WELL 4 MILES SOUTH OF PEARSALL, TEX.

UNDERGROUND WATERS OF THE COASTAL PLAIN OF TEXAS.

By T. U. Taylor.

INTRODUCTION.

Area covered.—The region to which this report relates includes the greater part of the Coastal Plain of Texas. It comprises an area about 150 miles wide, bordering the coast and extending across the entire State. According to R. T. Hill's classification it includes the "eastern" and "southern" provinces, and it is bordered on the west, from Del Rio to Colorado River, by the "Edwards Plateau," and, from the Colorado River to the Arkansas State line, by the "Black Prairie." It includes the district lying between the coast and a line connecting Texarkana with Del Rio, through Cooper, Greenville, Corsicana, Cameron, Elgin, and San Antonio, an area of about 75,000 square miles.

Sources of data.—The information on which this report is based has been obtained partly by personal visits to the various localities and partly by correspondence. Information has been furnished by the following persons: B. M. Haberer, C. F. H. von Blucher, Randolph Robertson, F. W. Simonds, H. W. Harper, Ira H. Evans, Rudolph Kleberg, T. J. Lyne, G. Warnicke, R. D. Parker, O. M. Ball, Garland Miller, A. W. Seeligson, J. B. Armstrong, J. L. Ladd, Travis L. Smith, E. D. Dorchester, Geo. C. Herman, Geo. J. McManus, J. E. Broussard, and J. W. Sanders. The writer is also indebted to Mr. E. T. Dumble, former State geologist of Texas, for much valuable information.

GEOGRAPHY OF THE REGION.

General statement.—The Coastal Plain of Texas is a continuation of the Atlantic Coastal Plain to the east, although in many features it differs from that area. In general it consists of a gently sloping plain extending from a high or mountainous background to the Gulf. In the eastern part of Texas the Coastal Plain has the general character seen in other Southern States, but in its southwestern extension it becomes more or less modified, widening to the southwest in the

vicinity of the Rio Grande where there is a great embayment similar to that of Mississippi River. South of Colorado River there is a well-defined interior border to the Coastal Plain, but to the north of that stream the transition between the level and hilly lands is gradual.

Topography.—The topography of the Texas Coastal Plain presents little variety. The surface rises gradually from the sea level at the coast to an elevation of 800 to 1,000 feet along the interior margin of the province. The portion of the plain bordering the coast is characterized by a very level surface which, throughout extensive areas, is scarcely broken, except by a few shallow drainage ways. The highest land along the coast is at Corpus Christi, where the bluffs rise to 40 to 60 feet above sea level. Toward the interior the surface of the plain becomes more diversified, developing into rolling hills which increase in number and prominence toward the western margin of the province.

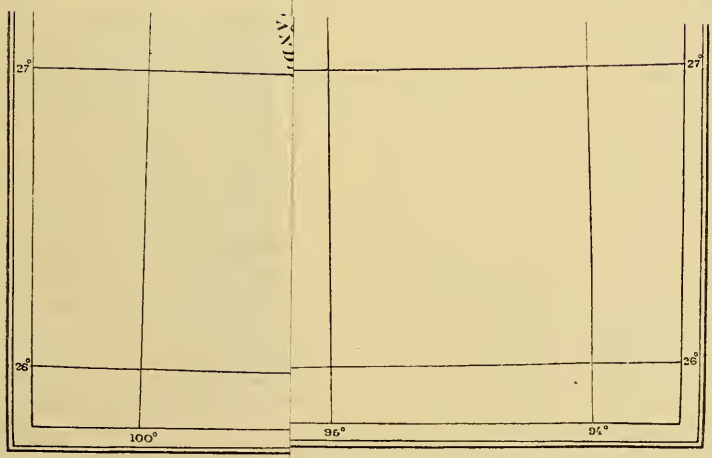
Drainage.—The Texas Coastal Plain is traversed by many streams. The largest of these are the Neches, Trinity, Brazos, Colorado, and Nueces rivers. Of all these streams only the Brazos enters the Gulf directly, the others emptying into lagoons or bays. South of the Nueces the drainage is not completely developed and the entire area between this stream and the Rio Grande contains only two small creeks, the San Fernando and Olmos, which unite to form Capano Bay. The larger streams of the area are generally narrow and deep, with feeble currents. Near the shore many of them expand into broad, shallow lakes entering the Gulf through shallow bays. While there are many streams in the Texas Coastal Plain, much of its surface is poorly drained, and in places water stands in lakes or ponds throughout the year.

GEOLOGY.

The Texas Coastal Plain is developed on a great thickness of soft rocks, sands, gravel, clays, and loams in general spread in thin but more or less extensive beds which dip very gently to the east. These sediments have a thickness of several thousand feet and are composed of alternating porous and impervious members, producing ideal artesian conditions. Over the greater part of the area the rocks are of Tertiary age, but along the interior border Upper Cretaceous sediments appear.

UNDERGROUND WATERS, BY COUNTIES.

General statement.—During recent years the underground-water resources of the Texas Coastal Plain have become of considerable economic importance. Ground water, which is usually abundant throughout the district, has been used for many years for general domestic purposes, and small irrigation plants in a few instances have derived their water supply from this source. Within recent years


27°
27°
26°
26°
100°
96°
94°

MAP SHOWING

ARTESIAN WELLS

OF THE

COASTAL PLAIN OF TEXAS

BY

T. U. TAYLOR

SCALE

25 0 25 50 miles

EXPLANATION

- Artesian wells (representative)
- o Deep wells
- ✧ Unsuccessful borings

REPORT

AREA TREATED

BOUNDARY OF

GULF OF MEXICO

MAP SHOWING LOCATION OF ARTESIAN WELLS IN THE TEXAS COASTAL PLAIN.

artesian wells have been obtained in various parts of the region. Some of these furnish flows adequate for considerable irrigation. Three of the larger cities in the region, Houston, Galveston, and San Antonio, derive their entire city water supply from artesian sources. At Houston the city water is supplied by 60 flowing wells, while at Galveston and San Antonio 15 and 30 wells, respectively, furnish the required amounts. In the vicinity of El Campo, Chesterville, and East Bernard shallow artesian wells are employed to a considerable extent for rice irrigation, especially where small crops are raised. In the vicinity of Webster, in the southern part of Harris County, the flow of several ordinary surface wells has been increased, by pumping, to such an extent as to furnish water for the irrigation of 60 to 100 acres of rice. The depth at which artesian water may be obtained in the Coastal Plain of Texas varies according to the locality. It ranges from a few feet to over 2,000 feet, but the average is about 600 feet.

The amount of flow of these wells varies from 20 to 1,600 gallons a minute. A typical artesian well of this district is shown in Pl. I. The water is more or less mineralized, but with few exceptions the dissolved salts are neither objectionable for domestic purposes nor deleterious to plant growth. The general distribution of artesian wells of the Coastal Plain of Texas is shown in Pl. II.

In the following discussion the underground-water resources of the region will be described by counties.

CAMERON COUNTY.

Shallow wells.—The depths of the shallow wells of Cameron County vary from 20 to 100 feet, according to the locality. Along the coast water can usually be procured at depths of 20 to 30 feet, but, owing to the nearness of the sea, it is generally salty. To the north, along the bay, the wells are somewhat deeper, ranging from 20 to 60 feet, and in the western part of the county the deepest wells occur, some exceeding 100 feet. At Brownsville and in the immediate vicinity the average depth of shallow wells is about 30 feet.

Artesian wells.—Artesian water is now obtained in the northern two-thirds of this county, at depths which vary from 600 to 1,200 feet. There are about 150 flowing wells in the county. The flows of these wells vary from 50 to 1,000 gallons a minute, the average being about 400 gallons. A group of artesian wells in the Rio Grande embayment is shown in Pl. III (p. 6). The following is a list of artesian wells in Cameron County:

Artesian wells in Cameron County.

THE KENEDY PASTURE COMPANY'S WELLS.

Name.	Driller.	Depth.	Flow per minute.
		Feet.	*Gallons.*
La Parra	Wm. Turcotte	710	75
Do	do	825	150
Do	do	890	600
San Juan	do	1,000	250
Abujon	do	1,030	300
Moyote	do	610	80
Sacahuistal	do	998	125
Eurebia	do	920	350
Shipping pasture	do	689	150
Devisadero	do	724	550
Cobos	do	645	60
Paistle	do	710	1,000
Salada	do	700	600
Corte Sacate	do	751	400
Mota del Diablo	do	1,019	500
Atravesada	Guffey & Galey	720	500
Alto	do	1,120	350
Casa Mott	White Bros	1,175	500
Palmito	W. P. Gano	1,035	600
Ramirez	do	1,123	450
Edwin Mallory	do	1,170	500
Padre Alejos	N. G. Allen	865	450
Sarita	Railroad	604	300
Mifflin	Town site	740	450
Turcotte	do	787	800
Snipe	Wm. Turcotte	620	700
Esperanza	do	747	600
Barasas	do	700	500
El Suspiro	do	615	300
La Saragote	do	652	450
Mujeres	do	660	400
Mesquite de Final	do	750	300
Paradiso	do	917	200
Tio Coulas	do	892	250
Tecolite	N. G. Allen	890	300
Motto Negra	Wm. Turcotte	1,080	250
Perez	Tom Leary	1,360	600
Agua Negra	W. P. Gano	1,125	550
Mentidua	do	1,033	500
Mestana	do	1,232	125
El Toro	Wm. Turcotte	1,025	350
Repara	do	1,130	300
Mayote, No. 2	W. P. Gano	1,147	700
San Juan, No. 2	Wm. Turcotte	890	70
Tio Martin	do	860	350
Picacho, No. 2	do	1,155	110
Mesquite	do	750	400
La Serpa	do	617	315
Miralcjos	do	862	115
Los Mojaras	do	760	450
Picacho, No. 1	Tom Leary	1,403	600
No name	do	1,314	350
La Piedra	Wm. Turcotte	950	350
La Tablome	do	1,000	350
Motta Palle	do	(a)	.....
Motta Romendonda	do	814	200
Townsite, No. 1	W. P. Gano	807	275
Townsite, No. 2	do	818	285
Medeneta	do	1,315	400
La Muerta	do	843	300
Bordos	Wm. Turcotte	862	160
Gansos, No. 1	W. P. Gano	1,234	350
Gansos, No. 2		(a)	.....
El Telephon	Wm. Turcotte	951	350
Railroad (new track)	W. P. Gano	803	350
Loma Prieta	Wm. Turcotte	(a)	.....
Courta Sacate	do	757	250

a In progress.

Artesian wells in Cameron County—Continued.

LOWER KING RANCH.

Name.	Driller.	Depth.	Flow per minute.
		Feet.	*Gallons.*
Andrea	A. W. Ferguson	530	70
Bandera	do	682	12
Resaca	do	747	200
Gigante	do	382	75
Comanche	do	668	35
Morris City	do	1,364	60
Vieja	J. C. Curry	851	300
Loma Prieta	do	838	300
Tampico	do	719	50

MAJ. J. B. ARMSTRONG'S WELLS.

Marana	Sanders & Allen	490	20
San Tomas	do	500	20
Comal	Thos. Fowler	830	150
Rincon	Curry & Sons	770	75
El Ruco	J. B. Armstrong	568	.....
Katharine	R. Robertson	730	60
Rodeo	J. C. Curry	805	100
Horben	do	857	150
Tokio	do	830	108
Los Tollidos	do	780	160
Ranch House	J. B. Armstrong	893	150
El Alonozo	do	(a)	.....

a In progress.

Record of Atravesada well, on Kenedy ranch, Cameron County.

	Feet.
Surface soil	0 – 1½
White sand, salty	1½ – 10
White sand	10 – 35
Fresh-water seep	35 – 45
Blue clay and bowlders	45 – 50
Sand and bowlders	50 – 80
Cemented shells	80 – 82
Sand	82 – 90
Sand and bowlders	90 –100
Cemented shells	100 –103
Clay bowlders	103 –110
Blue and brown clay	110 –140
Brown to buff clay	140 –265
Cemented shells, scallop shaped	265 –320
Brown to buff clay	320 –330
Soft sand rock	330 –335
Hard sand rock	335 –360
Tough clay	360 –380
Hard rock	380 –380½
Clay	380½–400
Hard rock	400 –400½
Clay	400½–420
Rock	420 –422
Clay	422 –440
Rock	440 –440½
Fine-grained bluish rock	440½–460
Stiff brownish clay	460 –470
Light-brown clay and sand	470 –555
Sand	555 –615

	Feet.	
Very hard gumbo	615–	640
Reddish gumbo	640–	694
Rock	694–	696
Clay	696–	700
Water-bearing sand; strong flow	700–	720
Red clay	720–	765
Hard red clay	765–	860

Record of well at Sauz ranch, Cameron County.

	Feet.	
Pale-red, sandy clay	0–	15
Sand	15–	30
Very pale-red clay, sandy	30–	50
Sand containing hard layers	50–	250
Sand with very soft blue clay	250–	315
Sand and bluish clay	315–	500
Sandstone	500–	512
Yellow sand	512–	517
Sandstone	517–	525
Sand	525–	529
Very hard bluish rock	529–	699
Rock and clay	699–	729
Red and blue clay with hard layers	729–	899
Bluish clay with red layers	899–	989
Reddish and greenish clay	989–	1,099
Sand	1,099–	1,104

Record of Ovejas well, 8 miles east of Sauz ranch, Cameron County.

	Feet.	
Soil and clay	0–	10
Sand and clay	10–	53
Clay and sand in hard and soft layers	53–	68
Sand	68–	81
White clay and gravels ("Equus beds")	81–	115
Sandy clay and sand rock	115–	134
Sand and sandstone	134–	185
Clay and sandstone	185–	208
Sand	208–	225
Blue clay	225–	278
Sand	278–	290
Sand and sandstone	290–	378
Blue clay	378–	408
Coarse sand	408–	421
Clay containing hard layers	421–	442
Sandstone	442–	450
Sand	450–	470
White clay	470–	476
Sand	476–	490
Bluish clay	490–	520
Sand and sandstone	520–	532
Bluish clay	532–	551
Sand and sandstone	551–	560
Blue clay	560–	585
Sandy clay	585–	596
Very fine sand	596–	613
Sand and sandstone	613–	630

ARTESIAN WELLS IN RIO GRANDE EMBAYMENT.

HIDALGO COUNTY.

Shallow wells.—Water is procured from wells in Hidalgo County at depths varying from 25 feet on the lower ground to 150 feet on the highlands. An abundant supply is usually obtained.

Artesian wells.—During the last few years many successful artesian wells have been bored in the northern half of Hidalgo County. These are located mainly on the Lasater, Sullivan, Armstrong, Ward & Russell, and King ranches. In January, 1906, information had been obtained of about 60 of these wells, but there are others about which no data are available. The following is a partial list of the wells, giving their depth and approximate flow.

Artesian wells in northern Hidalgo County.

ED. C. LASATER RANCH.

Name.	Driller.	Depth.	Flow per minute.
		Feet.	*Gallons.*
No. 9	O. S. Caldwell	460	10
No. 4	do	438	35
Realitos	Perry Downs	478	75
White Sulphur	do	484	75
Patricio	do	460	25

D. SULLIVAN RANCH.

Jap Twins	S. A. Hamlin	742	400
Do	do	1,008	600
Three-fourths mile	do	820	800
Tula Twin	do	630	300
Do	do	630	400
Olmos Creek	do	350	500
South Twin	do	530	200
Do	do	530	150

WARD & RUSSELL RANCH.

No. 1	S. A. Hamlin	±500	Flows.
No. 2	do	±500	Do.
No. 3	do	±500	Do.
No. 4	do	1,008	Do.

KING RANCH.

Gigante	A. W. Ferguson	382	75
Andrea	do	530	70
Mesquitine	do		
Tampico	do	719	50
Comanche	do	668	35
Resaca	do	747	200

A chemical analysis of the water of the White Sulphur well (Lasater ranch) is given below:

Analysis of water from White Sulphur well, Lasater ranch, Hidalgo County.[a]

	Parts per million.		Parts per million.
Ammonium (NH_4)	0.04	Total solids at 105°	1,090.00
Sodium (Na)	260.00	Total solids ignited, dull redness	1,000.00
Magnesium (Mg)	29.00	Loss on ignition	90.00
Calcium (Ca)	75.00	Albuminoid ammonia (NH_3)	.01
Iron (Fe)	2.60	Free ammonia (NH_3)	.023
Chlorine (Cl)	380.00	Nitrites	.007
Nitrate radicle (NO_3)	.02	Oxygen required	4.500
Sulphate radicle (SO_4)	170.00	Temporary hardness	140.00
Bicarbonate radicle (HCO_3)	120.00	Permanent hardness	68.00
Silica (SiO_2)	36.00		
Organic matter	12.00		
	1,084.66		

STARR COUNTY.

Shallow wells.—Water is generally obtained at shallow depths throughout Starr County, but along the Rio Grande a large portion of the inhabitants use river water.

Artesian wells.—Artesian water is found in the northeastern part of the county, near the town of Falfurrias. The wells range in depth from 540 to 1,020 feet. In the deeper borings five distinct water horizons are encountered, some of which have a capacity of 250 gallons a minute. The water is used extensively for irrigation, and during the last two years the progress in artesian irrigation has been very rapid. The following is a list of wells in Starr County:

Artesian wells in Starr County.

Name.	Depth.	Flow per minute.	Name.	Depth.	Flow per minute.
	Feet.	*Gallons.*		*Feet.*	*Gallons.*
Los Mosquitos	710	25	Colosa	669	100
Mesquite	540	100	Railroad	810	150
Alto Bonito	562	250	Tank	756	100
Barendo	526	30	Falfurrias No. 2	1,020	80
Copa	603	30	Falfurrias No. 3	700	110
Falfurrias No. 1	800	15	Copita	664	75
Novilla	760	75			

[a] Analysis by H. W. Harper and B. L. Glascock, school of chemistry, University of Texas, Austin, April, 1903.

An analysis of the water from the Mesquite well is given below:

Analysis of water from Mesquite well, Lasater ranch, Starr County.[a]

	Parts per million.
Ammonium (NH_4)	0.07
Sodium (Na)	170.00
Magnesium (Mg)	.3
Calcium (Ca)	38.00
Iron (Fe)	.1
Chlorine (Cl)	.4
Nitrate radicle (NO_3)	None.
Sulphate radicle (SO_4)	39.00
Bicarbonate radicle (HCO_3)	150.00
Silica (SiO_2)	18.00
Organic matter	44.00
	459.87

	Parts per million.
Total solids at 105°	680
Total solids ignited, dull redness	610
Loss on ignition	70
Albuminoid ammonia (NH_3)	.062
Free ammonia (NH_3)	.006
Oxygen required	16
Temporary hardness	230
Permanent hardness	19

NUECES COUNTY.

Shallow wells.—At most places throughout Nueces County water can be obtained at depths of 30 to 40 feet, but in the southern part of the county many of the shallow wells furnish brackish water. There are wells in the northern part of the county which range in depth from 50 to 180 feet. The deepest of these penetrated a water-bearing sand which furnishes 60 gallons of water a minute. Throughout the eastern part of the county water is obtained at a depth of 35 to 40 feet, but much of it is saline. Along the west side of the county the wells 80 feet deep supply only a small amount of water, while those which have been bored to a depth of 150 feet afford an abundance, and in many of them the water rises to within 70 feet of the surface.

Artesian wells.—Artesian water is secured throughout the southern two-thirds of this county at depths which vary from 490 to 1,240 feet. In the amount of flow these wells range from a few gallons to over 600 gallons a minute. So far no flowing wells have been obtained north of the Texas and Mexico Railroad, although borings have been made at Alice, Robstown, and Corpus Christi. The northernmost of the successful wells in this county are on the Driscoll ranch. A list of the artesian wells, giving their depth, flow, and other data, follows.

[a] Analysis by H. W. Harper and C. Hartmann, school of chemistry, University of Texas, Austin, April, 1903.

Artesian wells in Nueces County.

KING'S WELLS.

Name.	Driller.	Depth.	Flow per minute.
		Feet.	*Gallons.*
Palo Alto No. 1	T. Herring	552	20
Palo Alto No. 2	do	704	20
Santa Gertrudis No. 1	do	535	125
Parrita	do	470	350
Ebanito No. 1	do	456	250
Ebanito No. 2	do	475	100
Fitch	do	396	100
Jenson	do	402	225
Baltimore	do	474	110
Canelo	do	495	250
Oaso Ancho	do	590	40
Lower Little Pasture	do	545	50
Santa Gertrudis No. 2	do	550	75
Coyote	do	795	30
Chiltipin	do	840	25
Burro	do	928	300
Telephone	do	874	75
Portales	do	1,085	100
Guayacan	do	905	100
Jaboncillos	do	948	60
Rincon de Los Cabellos	King Machinery Co.	764	400
Bovida	do	720	300
Retamosa	do	447	30
Conchas	do	427	30
Vivoras	do	989	10
Visnaga	do	913	40
Santa Gertrudis No. 3	A. W. Ferguson	565	160
Santa Gertrudis No. 4	do	560	100
Alazan	do	423	40
Santa Clara	do	525	400
Valederas	Tom Leary	591	400
Rincon de Tio Pancho	do	615	400
Leoncitas	do	570	250
Tranquitas	do	655	50
Little Pasture	do	574	60
Rediche	do	680	200
Tranquecitos	do	640	150
Caldwell	do	540	150
Indios	do	480	100
Mota Negra	do	550	25
Palo Marcado	do	700	5
Comitas	do	578	300
Homer	A. B. Fuller	506	50
Alazan No. 2	King Machinery Co.	465	90
Cobeza	do	410	60
Priesta	do	635	100
Ebenito	do	397	25
Leoncitas No. 2	do	1,050	75
Herring	T. Herring	805	20
Young	J. P. Morris	630	50
Taylor	T. Herring	620	40
Johnson	J. P. Morris	626	40
Reed	T. Herring	616	70
Harper	R. J. Mills	625	100
Kingsville	R. Robertson	609	75
Simms	W. J. House	600	34
McNeil	T. Herring	610	75
Warren	A. B. Fuller	628	110
Huffman	T. Herring	630	66
Jesse	J. P. Morris	640	.....
Weir	W. J. House	(a)	.....
Harvey	T. Herring	632	100
Hoffman	do	626	75
Alexander	do	.....	.....
Penn	W. J. House	650	150
Santa Gertrudis No. 5	King Machinery Co.	580	40

a In progress.

Artesian wells in Nueces County—Continued.

SEELIGSON'S WELLS.

Name.	Driller.	Depth.	Flow per minute.
		Feet.	*Gallons.*
Las Luchas	C. Premont	464	50
Balli	do	633	65
Galveston ranch	do	630	8
Lindero	do	475	75

ANNA COLLINS'S WELLS.

Creek	White Bros	625	50
Mota	do	825	9
Copita	do	918	150
Corner	do	790	50

ROBERT DRISCOLL'S WELLS.

Palito Blanco	Chas. P. Fox	612	150
Quates	do	653	100
Dunn ranch	Leary & Gano	525	25
Do	Thos. Fowler		60
Do	do		100

ANDRES CANALES'S WELLS.

La Cabra	F. Rosales	440	80
Ranchito	do	458	80

CHARLES WEIL'S WELL.

Flowing well	Leary & Gano	558	35

RAGLAND & HERRING'S WELLS.

Flowing well	T. Herring	470	100
Do	W. C. Downing	499	60

TEXAS LAND AND CATTLE COMPANY'S LAURELES RANCH WELLS.

Shipping Pasture	O. S. Caldwell	1,130	40
San Vicente	do	926	30
Santa Cruz	do	1,068	160
Mujeres	J. McAlester	1,020	120
Rincon La Salle	do	1,240	240
Garcia	do	1,150	25
Rincon La Salle	do	1,185	60
Headquarters	do	998	80
Rincon La Salle	do	1,295	35

Record of Galveston well, Seeligson ranch, about 30 miles south of Alice, Nueces County

	Feet.	
Light-colored clay	0–	19
Soft sandstone	19–	39
Very hard, white flinty rock	39–	119
Pink to yellowish clay	119–	199
Reddish clay mixed with bowlders	199–	359
Coarse gray sand	359–	404
Sand and clay	404–	437
Sand and coarse gravel	437–	453
Sand and clay	453–	549
Sand and gravel	549–	569
Rock and sand in alternate layers	569–	589
Sand mixed with small pebbles	589–	610
Fine-grained gray sand (water bearing, 10 gallons per minute)	610–	631
White calcareous clay	631–	686
Hard clay containing bowlders	686–	736
Gray sandstone	736–	756
Blue clay	756–	776
Blue clay with yellow spots	776–	816
Blue clay, fine grained	816–	856
White clay with yellow spots (not water bearing)	856–	1,601

Analysis of water from Santa Clara well, on King's ranch, Nueces County.[a]

	Parts per million.		Parts per million.
Ammonium (NH)	.01	Total solids at 105°	680
Potassium (K)	11.00	Total solids ignited, dull redness	600
Sodium (Na)	130.00	Loss on ignition	80
Magnesium (Mg)	16.00	Albuminoid ammonia (NH_3)	.014
Calcium (Ca)	35.00	Free ammonia (NH_3)	None.
Iron (Fe)	2.00	Nitrates	.05
Chlorine (Cl)	140.00	Nitrites	None.
Nitrate radicle (NO_3)	.05	Oxygen required	13
Sulphate radicle (SO_4)	140.00	Temporary hardness	260
Bicarbonate radicle (HCO_3)	140.00	Permanent hardness	None.
Silica (SiO_2)	24.00		
Organic matter	40.00		
	678.06		

[a] Analysis by H. W. Harper and E. Anderson, school of chemistry, University of Texas, Austin, April, 1903.

Analysis of water from Balli well, Sceligson ranch, Nueces County.[a]

	Parts per million.		Parts per million.
Ammonium (NH_4)	0.08	Total solids at 105°	1,080
Potassium (K)	8.30	Total solids ignited, dull redness	930
Sodium (Na)	270.00	Loss on ignition	150
Magnesium (Mg)	.90	Albuminoid ammonia (NH_3)	.06
Calcium (Ca)	69.00	Free ammonia (NH_3)	.014
Iron (Fe)	2.00	Nitrates	.006
Chlorine (Cl)	250.00	Temporary hardness	210
Nitrate radicle (NO_3)	.01	Permanent hardness	63
Sulphate radicle (SO_4)	250.00		
Bicarbonate radicle (HCO_3)	180.00		
Silica (SiO_2)	33.00		
Organic matter	78.00		
	1,141.29		

SAN PATRICIO COUNTY.

Shallow wells.—In San Patricio County the shallow wells vary in depth from 20 to 130 feet, and they usually furnish a large supply of water.

Artesian wells.—Only a few artesian wells have been bored in this county. A partial list of these is given below:

Artesian wells in San Patricio County.

Owner.	Depth.	Flow per minute.	Diameter.
	Feet.	*Gallons.*	*Inches.*
Coleman & Fulton	983	60	4¼
Mrs. M. M. Murphy	365	.....	.....
S. G. Miller	290	Flows.	.....

REFUGIO COUNTY.

Shallow wells.—The depth of shallow wells in Refugio County varies from 10 to 60 feet, and they generally furnish a sufficient amount of water for ordinary domestic purposes.

Artesian wells.—Information has been obtained of five artesian wells located on O'Connor's ranch. The depth, flow, and approximate location of these wells are given in the following table:

[a] Analysis by H. W. Harper and Barney Brooks, school of chemistry, University of Texas, Austin, April, 1903.

Artesian wells in Refugio County.

Owner.	Depth.	Flow per minute.	Distance and direction from Anaqua.
	Feet.	*Gallons.*	
O'Connor	946	60	7.5 miles south, 5 miles west.
Do	826	175	14 miles south, 15 miles west.
Do	1,204	175	11.5 miles south, 25 miles west.
Do	972	150	13 miles south, 5 miles east.
Do	1,000	40	19 miles south, 8 miles east.

ARANSAS COUNTY.

Shallow wells.—In Aransas County, which borders the coast, water is obtained at depths varying from 25 to 80 feet.

Artesian wells.—There are at present no artesian wells in this county, and as far as can be ascertained no prospecting has been done.

CALHOUN COUNTY.

Shallow wells.—The average depth of shallow wells throughout Calhoun County is 30 feet, and in most cases an abundant supply is obtained.

Artesian wells.—There are 21 artesian wells in Calhoun County, mainly on the ranch of T. M. O'Connor. Their approximate location, together with other data, is given in the following table:

Artesian wells in Calhoun County.

Owner.	Depth.	Flow per minute.	Distance and direction from Point Lavaca.
	Feet.	*Gallons.*	
C. A. Mitchell [a]	380	Weak.	4 miles northeast.
J. E. Shutt [b]	802	63	
H. C. Clark	496	12	8 miles southeast.
Do	330	8	8 miles south.
Do	360	.....	Do.
Thomas estate	441	4	4 miles south.
Do	442	6	5 miles south.
Do	500	9	7 miles southwest.
J. B. Watkins	366	.....	9 miles south.
T. M. O'Connor:			
Oil	780	.....	14 miles southeast.
Boggy	572	.....	16 miles southeast.
Old pens	570	.....	14 miles southeast.
Johnny Woods	600	.....	12 miles southeast.
Double dams	540	.....	Do.
Ceiu Pond	490	.....	14 miles southeast.
Eclipse No. 1	480	.....	Do.
Queen	482	.....	15 miles southeast.
Branding pen	460	.....	13 miles southeast.
Perry Bend	480	.....	11 miles southeast,
Eclipse No. 2	316	.....	12 miles southeast
Tule Pond	315	.....	10 miles south.
Eclipse No. 3	320	.....	11 miles south.
Bayshore Dandy	390	.....	15 miles south.
Eagle Nest	460	.....	Do.
Alligator	1,484	.....	16 miles south.
Dugan dam	280	.....	17 miles south.
Salt flat	275	.....	18 miles south.
Middle Dandy	420	.....	15 miles south.
Fence line	480	.....	14 miles south.
25-foot Dandy	480	.....	Do.

[a] Diameter 1½ inches

[b] Diameter 2 inches.

Record of well at Alligator Head, Calhoun County.[a]

	Feet.
Surface soil	0– 3
Fine white quicksand	3– 21
White clay	21– 43
Greenish clay containing shells	43– 80
Gray sand	80– 83
Hard yellowish clay	83– 160
Coarse sand containing shells	160– 166
Hard clay containing shells	166– 210
Sand	210– 225
Hard clay containing oyster shells	225– 320
Sand containing oyster shells	320– 365
Blue clay containing a few shells	365– 452
Coarse gray sand	452– 476
Conglomerate	476– 551
Gray sand	551– 567
Conglomerate with layers of blue clay	567– 694
Gray sand, traces of oil	694– 704
Hard rock	704– 707
Light sand, traces of oil	707– 710
Blue clay	710– 713
Hard rock with soft layers	713– 725
Gray sand containing fragments of shells	725– 767
"Shell concrete"	767– 887
Sand, water and oil bearing	887– 912
Conglomerate	912– 916
Gray sand	916– 942
Blue clay containing bowlders and shells	942–1,008
Light-colored clay and fine gray sand in alternate layers	1,008–1,022
Blue clay	1,022–1,039
Rock	1,039–1,042
Blue clay containing bowlders and shells	1,042–1,051
White sand, traces of oil	1,051–1,052
Blue clay with hard layers	1,052–1,056
Light-colored clay with hard layers	1,056–1,087
White sand, water bearing	1,087–1,097
Red and blue clay	1,097–1,230
Light-colored clay iron stained	1,230–1,462
Variegated clay	1,462–1,484

VICTORIA COUNTY.

Shallow wells.—Shallow wells are obtained in Victoria County at depths varying from 30 feet in the southern part to 80 feet in the northern and western parts.

Artesian wells.—Information has been received of 17 artesian wells in this county. The majority of these wells are on the Keeran ranch in the watershed of Garcitas and Aranosa creeks. The following is a list giving their depth, flow, diameter, and approximate location:

[a] Furnished by J. D. Mitchell, Victoria, Tex.

Artesian wells in Victoria County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	Feet.	*Gallons.*	*Inches.*	
Rathbone & Weeder	1,045	80	.....	City of Victoria.
J. N. Keeran	180	Flows.	.....	Southeast of Victoria.
Do	200	Flows.	.....	Do.
Do	148	Flows.	.....	Do.
Do	705	Flows.	.....	Do.
Do	130	Flows.	.....	Do.
Do	77	Flows.	.....	Do.
Do	50	Flows.	.....	Do.
Do	222	Flows.	.....	Do.
Do	110	Flows.	.....	Do.
Do	140	Flows.	.....	Do.
Do	425	Flows.	.....	Do.
Do	180	Flows.	.....	Do.
A. M. McFadden	716	10	2	Kemper, 1.5 miles south.
Do	592	10	3	Kemper, 1.7 miles south.
Ross Clark	152	50	2	Kemper, 7 miles northn.
Jno. T. Rusk	226	00	.....	Inez, 7 miles north.

JACKSON COUNTY.

Shallow wells.—Water is obtained in the eastern part of Jackson County at depths varying from 25 to 40 feet; in the southern and western parts from 40 to 60 feet; and in the northern part from 25 to 45 feet.

Artesian wells.—Artesian water has been found in this county south of the New York, Texas, and Mexican Railway, and it is believed by local observers that artesian water can be obtained almost anywhere in the northern part of the county. The following table gives a list of the wells, with their depth, flow, and approximate location.

Artesian wells in Jackson County.

Owner.	Depth.	Flow per minute.	Location.
	Feet.	*Gallons.*	
C. Branch	223	7	Edna, 10 miles southeast.
Do	365	5	Do.
H. Bowers	360	42	Edna, 16 miles southeast.
S. Mitchell	402	4	Edna, 25 miles southeast.
R. Clement	398	2	Edna, 14 miles southeast.
W. Westhoff	785	6	
Buhler	325	.....	
L. Ward	324	.....	
A. W. Lewis	362	150	Carancohue, 2 miles east.
R. E. Ward	330	60	Carancohue, 3 miles east.
Do	338	100	Carancohue, 7 miles south.
Do	348	40	Carancohue, 10 miles southeast.
Do	366	100	Carancohue, 6 miles east.
Do	401	50	Carancohue, 5 miles southwest.
Thos. Dewees	893	.....	
Do	777	.....	
Do	540	.....	
Bennett & West	360	.....	
Do	152	.....	
Do	560	.....	
Do	240	.....	
Do	480	.....	
Do	355	.....	
Do	450	.....	

A well owned by S. H. Beasley, drilled in 1903 close to the west bank of Navidad River, about 1 mile north of the crossing of the New York, Texas and Mexican Railway, has the following record:

Record of Beasley well in central Jackson County.

	Feet.
Sandy soil	0 – ½
Red clay	½– 16
Red sand	16 – 30
Red clay	30 – 46
Rock	46 – 47
Sand	47 – 55
Rock	55 – 56
Sand and red clay in alternate layers	56 –120
Sand	120 –140
Rock	140 –141
Sand	141 –223
Red clay and sand	223 –249
Rock	249 –258½
Clay and rock	258½–268½
Red clay	268½–270½
Sand	270½–285½
Rock	285½–286
Red clay	286 –287
Sand	287 –289
Rock	289 –290
Sand	290 –311
Rock	311 –335½
White clay	335½–339
Sand	339 –361
Rock	361 –387½
Sand	387½–408½
Rock	408½–411
Sand	411 –414
Rock	414 –424
Sand	424 –465
Rock	465 –469
Sand	469 –479
Rock	479 –481
Sand	481 –498
Rock	498 –510
Sand	510 –521
Rock	521 –525
Sand	525 –545
Red clay	545 –548
Sand	548 –558
Red clay	558 –566
Sand	566 –586
Rock	586 –596
Sand	596 –640
Blue clay	640 –650
Sand and clay in alternate layers	650 –665
Rock	665 –669
Sand	669 –675

	Feet.
Rock	675– 676
Sand and clay in alternate layers	676– 695
Rock	695– 698
Sand	698– 771
Blue clay	771– 777
Red sand	777– 799
Red clay	799– 852
Red and blue clay	852– 910
Red clay	910– 950
White clay	950– 995
Blue clay	995–1,000
Sand	1,000–1,007
Red clay	1,007–1,009
Water-bearing sand	1,009–1,022
White clay	1,022–1,038
Sand	1,038–1,060
Clay	1,060–1,107
Soft mud	1,107–1,112
Red clay	1,112–1,140
Rock	1,140–1,144
Clay	1,144–1,155
Rock	1,155–1,156
Red clay	1,156–1,200
Soft mud	1,200–1,238
Rock	1,238–1,245
Soft mud	1,245–1,270
Clay	1,270–1,330
Sand, fine water bearer	1,330–1,370

An artesian well owned by Russell Ward, 25 miles from Edna, in the southeast corner of Jackson County, has the following record:

Record of Ward artesian well in southeastern Jackson County.

	Feet.
Surface soil	0– 10
Red clay	10– 20
"Oyster shells"	20– 25
Red clay	25–110
Fine sand, water bearing	110–130
Blue clay	130–155
Thin layer of rock	
Blue clay	155–225
Soft black mud	225–230
"Water sand" and gravel	230–260
Red and white clay	260–290
Layer of thin rock	
Red and white clay	290–330
Sand and gravel, artesian water bearing	330–365

MATAGORDA COUNTY.

Shallow wells.—In Matagorda County shallow wells are from 15 to 30 feet deep.

Artesian wells.—Artesian water has been secured at many places, especially in the southern part of the county. Data respecting these wells are given in the following table:

Artesian wells in Matagorda County.

Owner.	Depth.	Diameter.	Flow.		Location.
			Per minute.	Above surface.	
	Feet.	*Inches.*	*Gallons.*	*Feet.*	
J. E. Pierce	356	4	50	8	Bay City, 25 miles southwest.
Do	[a] 380	4	15	4	Bay City, 22 miles southwest.
Do	280	4	10	2	Do.
Do	280	4	10	2	Do.
Do	350	4	50	8	Do.
Do	336	4	15	3	Blessing.
Do	350	4	60	16	Blessing, 3 miles south.
A. B. Pierce	465	4	60	15	Palacios, 4 miles northeast.
J. E. Pierce	485	4	50	10	Palacios, 10 miles south.
A. B. Mayes Oil Co	[b] 870	4	20	10	Matagorda, 5 miles northeast.
C. C. Duson	326	6	30	.5	Midfield.
J. L. Jordan	530	4	75	8	Blessing, 1½ miles west.
Morre-Cortes	125	3	5	2	Markham, 1 mile south.
Tackett & Co	460	6	100	20	Palacios, 1 mile northwest.
Ward Cattle Co	350	4	75	20	Palacios, 5 miles northwest
L. Ward	326	4	25	2	Midfield, 4 miles southwest.
Platner & Stoddard	440	2	10	4	Wadsworth, 1.5 miles southeast.
J. T. Sargent	[c] 81	4	7	2	Hawkinsville, 6 miles southeast.
Cane Belt Railroad	460	6	150	4	Bay City.
Southern Pacific Railroad	320	6	40	4	Palacios.
J. L. Ladd	444	2	15	1.2	Bay City.
Palacios (town)	572	4	60	4	Palacios.
Palacios College	620	4	75	6	Do.
A. H. Pierce	1,500	.....	0	.....	Bay City, 9 miles north.
Palacios	800	.....	0	.....	Palacios.
Cobell & Hughes	1,100	.....	0	.....	Ashby.

[a] Sulphur water at 280 feet; bored 100 feet farther and good water obtained.
[b] Bored for oil; flows warm sulphur water, which is slightly saline.
[c] John T. Sargent has about 12 deep wells on his ranch. They average about 80 feet in depth and the water rises within 2 feet of the surface.

WHARTON COUNTY.

Shallow wells.—In Wharton County west of Colorado River water can be obtained from wells varying in depth from 15 to 30 feet. In the vicinity of El Campo many rice farms are supplied with water from shallow wells. Here the water-bearing sand lies about 15 feet below the surface. A pit 4 to 6 feet in diameter is dug to the water-bearing sand and in the bottom of this excavation three or four wells are drilled. These wells are all cased, and to the top of the casing centrifugal pumps, operated by engines on the surface, are attached. In this way a large supply of water is brought to the surface and used extensively in the irrigation of rice. The most successful shallow-well irrigation plants in Texas are in the vicinity of El Campo.

Artesian wells.—On account of the shallow depth at which ground water can be secured, few attempts have been made to obtain artesian water. The only artesian well in the county of which a record has been kept is known as the Borden well and was drilled in 1892. It

is located near Pierce and has a depth of 1,509 feet. A complete record of the beds penetrated is given below:

Record of A. P. Borden well, Pierce station, Wharton County.

	Feet.
Clay and sand	0– 30
Red sand	30– 35
Quicksand	35– 43
Blue clay	43– 53
Indurated sand	53– 70
Yellow clay and sand	70– 100
Coarse sand	100– 106
Red clay	106– 127
Clay and sand	127– 191
Coarse sand	191– 214
Fine sand	214– 250
Red clay	250– 254
Fine sand	254– 270
Yellow clay	270– 280
Sand and clay	280– 300
Fine white sand	300– 373
Indurated sand, very hard	373– 383
Yellow sand	383– 385
Indurated sand, very hard	385– 410
Yellow sand mixed with thin layers of clay	410– 460
Sand, clay, and gravel	460– 476
Indurated sand, very hard	476– 485
Indurated sand, soft and hard layers alternating	485– 529
Indurated sand, very hard	529– 549
Red and white clay	549– 582
Fine white sand	582– 590
Indurated sand with soft layers	590– 612
Hard clay	612– 650
Very hard sandstone	650– 687
Limestone, very hard	687– 693
Very coarse sand	693– 696
Limestone, very hard	696– 700
White clay	700– 730
Very hard white clay	730– 745
Soft mottled clay	745– 786
Red mottled clay	786– 818
Red sand	818– 838
Quicksand	838– 850
Red clay	850– 890
Gray sand	890– 920
Very hard white clay	920– 938
Gray sand	938– 970
Indurated sand	970– 976
Fine gray sand	976– 996
Hard clay	996–1,000
Hard gray sand	1,000–1,010
White clay	1,010–1,015
White sand	1,015–1,039
White clay	1,039–1,050
Very hard white clay	1,050–1,053

	Feet.
Rock	1,053–1,065
Very hard white clay	1,065–1,076
Sandstone and hard blue clay	1,076–1,128
Water-bearing sand, gray	1,128–1,150
White clay	1,150–1,205
Red clay	1,205–1,359
Fine red sand	1,359–1,366
Red clay	1,366–1,450
White clay	1,450–1,470
White clay with sand	1,470–1,509

In the southern part of Wharton County, near the Matagorda County line, there are two small artesian wells owned by the Texas Land and Cattle Company. These are 2-inch wells, 315 and 513 feet deep, respectively, the former having a flow of 1 gallon and the latter 8 gallons a minute.

BRAZORIA COUNTY.

Shallow wells.—Water is obtained from shallow wells throughout Brazoria County at depths which vary from 15 to 30 feet.

Artesian wells.—Flowing wells are widely distributed throughout the county, on both the east and west sides of Brazos River. They vary considerably in depth, some being over 1,000 feet, and in the amount of flow they range from a few gallons to over 700 gallons a minute. The water is generally of good quality, but from a few wells saline flows have been reported.

Artesian wells in Brazoria County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	Feet.	*Gallons.*	*Inches.*	
E. D. Dorchester	1,060	720	8	Velasco.
Quintana	640	60	4	Quintana.
E. D. Dorchester	1,000	180	4	Surfside.
Oil-mill site	600	90	4	Velasco.
Guy M. Bryan	1,020	200	4½	Velasco, 6 miles west.
S. H. Hudgins	450	Slight.	2	Velasco, 6 miles east.
Do	....do...		2	Velasco, 3 miles east.
J. S. Hogg	250	100	10	Columbia, 3 miles northwest.
Do	500	100	10	Do.
Do	700	Slight.	10	Do.
State farm	504	.....	10	West of Brazos.
Do	365	.....	.....	Do.
Do	950	.....	.....	Do.
Do	800	.....	.....	Do.
Do	1,030	.....	.....	Do.
Do	1,040	.....	.....	Do.
Do	1,050	.....	.....	Do.
County	1,100	.....	4	Brazoria.
J. P. Bryan	600	90	8	Bryan Heights.
Oil well	1,000	.....	.....	Alvin.
Do	1,000	.....	.....	Do.
H. L. Skeets	911	Slight.	6	Alvin, 3 miles southeast.
R. Willis	785	....do...	3½	Do.
H. Masterson	603	Strong.	6	Alvin, 3 miles south.
E. B. Thomas	772	.....	12	Alvin, 2½ miles southeast.
W. H. Bush	704	.....	.....	Alvin.
E. M. Miller	1,200	.....	.....	Manvell, 2 miles south.
W. J. Moore	650	Strong.	.....	Alvin, 8 miles northwest.
Santa Fe R. R	700	.....	.....	Alvin.
Willis heirs	760	.....	.....	Sandy Point, 2 miles northwest.
J. S. Daugherty	300	.....	.....	Alvin, 6 miles north.
Do	300	.....	.....	Alvin, 10 miles north.
Guffey	600	Strong.	.....	Damon mound.

Record of Arnold well No. 3, Columbia, Brazoria County.

	Feet.
Surface soil, clay, and sand	0 – 85
Rock	85 – 85½
Sand	85½ – 88
Rock	88 – 89½
Oil sand	89½ – 118
Clay	118 – 150
Rock	150 – 158
Blue clay	158 – 192
Soft rock	192 – 196
Sand	196 – 210
Soft rock	210 – 212
Blue clay	212 – 218
Soft rock	218 – 219
Blue clay	219 – 260
Soft lime rock	260 – 261
Blue clay, very tough	261 – 275
Rock (hard layer at 294 feet contains some gas)	275 – 299
Hard rock	299 – 315
Crystallized sand	315 – 328
Blue clay	328 – 333
Rock	333 – 338
Sand	338 – 343
Blue clay	343 – 346
Compact sand	346 – 354
Clay	354 – 368
Rock	368 – 370
Clay	370 – 395
Soft rock	395 – 397
Blue clay	397 – 405
Rock	405 – 406
Blue clay	406 – 428
Crystallized sand	428 – 462
Blue clay, very hard and oil saturated	462 – 484
Soft rock	484 – 486
Blue clay	486 – 510
Sand, very compact	510 – 532
Rock, full of pyrites and shell	532 – 534
Sand, very compact	534 – 574
Hard rock, conglomerate, pyrites, and lime; rock sulphur and shell	574 – 582
Hard blue clay	582 – 620
Rock, pyrites, sulphur, lime, volcanic crystals, and oil saturations	620 – 628
Blue clay	628 – 632
Rock with sand	632 – 651
Sand	651 – 657
Rock	657 – 675
Hard rock	675 – 676
Sand	676 – 678
Very hard rock	678 – 680
Sand, color of oil	680 – 681
Rock, very hard	681 – 682
Sand	682 – 691

	Feet.
Blue clay	691 – 719
Sand	719 – 723
Blue clay	723 – 729
Oil sand	729 – 734
Blue clay	734 – 800
Sand	800 – 835
Shell with some little showing of oil	835 – 857
Blue clay, very thin strata full of shell	857 – 858
Sand	858 – 870
Blue clay	870 – 906
Crystallized sand	906 – 926
Rock	926 – 936
Blue clay	936 – 943
Sand	943 – 970
Soft sandstone	970 – 971
Hard sandstone	971 – 973
Clay	973 – 989
Sand	989 –1,002
Hard rock	1,002 –1,004
Sand, fairly firm, contains fossil wood	1,004 –1,012
Hard clay	1,012 –1,050
Sand with a little gas	1,050 –1,110
Blue clay	1,110 –1,115
Sand	1,115 –1,136
Soft rock, or compact sand	1,136 –1,214

Clay, blue with a greenish cast.

Record of well on lot 234, Hoskins Mound (midway between Velasco and Alvin), Brazoria County.

	Feet.
Black surface clay	0 – 4
Pale blue clay	4 – 12
Red clay	12 – 25
Yellow loamy sand, rather fine	25 – 45
Blue gumbo	45 – 85
Blue quicksand	85 –130
Blue clay filled with small white shells	130 –152
Blue quicksand	152 –172
Blue gumbo, very tough	172 –233
Blue sand, fine grained, with black specks; first indication of oil	233 –239
Sand with some clay	239 –378
Blue sand, coarse, with black specks; some oil near bottom	378 –423
Blue clay with some small shells	423 –465
Coarse blue sand with black specks	465 –500
Blue sand with some brown layers, contains iron pyrite and some small shells	500 –530
Soft blue clay with small shells	530 –535
Blue clay with larger shells	535 –555
Blue clay with few shells	555 –580
Blue gumbo, very tough; shells	580 –595
Tough blue clay with few shells	595 –628
Blue sand with gravel and some shells	628 –632½
Blue sand with coarse black particles	632½–642½
Blue clay with large shells	642½–654
Blue clay with shell fragments	654 –674

	Feet.
Blue sand, gravel with black particles; considerable gas	674 –684
Blue sand with many black particles; good show of oil from 688 to 692 feet	684 –692
Bluish sand, coarse; shows oil saturation	692 –711
Tough blue clay containing shells	711 –720
Tough blue gumbo containing bowlders	720 –722
Blue clay and sand; show of oil	722 –728
Blue clay with thin layers of sandstone	728 –735
Tough blue gumbo	735 –755
Blue gumbo with thin layers of sandstone and limestone	755 –778
Blue sand with iron pyrites; some show of oil at 778 feet	778 –783
Tough blue gumbo with thin layers of sandstone and limestone; considerable iron pyrites	783 –786
Blue gumbo with shells	786 –793
Sand with iron pyrites; "oil show"	793 –794
Tough blue gumbo	794 –799
Very hard blue clay with rock 2 to 6 feet thick, mostly limestone.	799 –825

FORT BEND COUNTY.

Shallow wells.—Water in sufficient quantity for ordinary domestic purposes is obtained throughout Fort Bend County at depths of 15 to 40 feet.

Deep wells.—A few deep pump wells have been sunk. Two on the Cunningham farm near Sugar Land are 1,000 feet deep. The town of Richmond derives its water supply from a pump well 400 feet deep. The following is a list of some of the deeper wells in this region.

Deep wells in Fort Bend County.

Owner.	Depth.	Capacity.	Location.
	Feet.	*Gallons.*	
T W. House	925	60	Arcola, 2 miles southwest.
Do	1,000	60	
City waterworks	400	.....	Richmond.
Cunningham farm	1,000	.....	Sugar Land.
Do	1,000	.....	Do.

HARRIS COUNTY.

Shallow wells.—Good shallow wells have been bored in Harris County, at Clodine, Erin, Katy, and Deepwater, and it is believed that wells of this character may be obtained throughout the county. In the vicinity of Clodine, on the rice farms of the Meadow Brook Company, the wells are generally 150 feet deep and 10 inches in diameter, the water rising within 15 to 20 feet of the surface. Wells on the J. H. O'Donnell farm, at Erin, are less than 100 feet deep and penetrate 46 feet of water-bearing sand. At Katy the two wells of J. E. Cabaniss are 93 and 94 feet deep.

Artesian wells.—There are about 140 artesian wells in Harris County, 80 of these being at Houston, where the artesian water resources have been better developed than in any other part of the

State. The city water supply of Houston is derived from 60 artesian wells which have been drilled in an area of 14 acres lying on either side of Buffalo Bayou. The general distribution of these and other artesian wells in Harris County is shown in Pl. II (p. 2), and the following tables contain all available information concerning them:

Artesian wells in Harris County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	Feet.	*Gallons.*	*Inches.*	
A. L. Smith	570	Flows.	.....	Webster, 1 mile south.
H. D. T. Wilson	520	Flows.	.....	Webster.
S. Seibara	670	Flows.	.....	Webster, ¼ mile east.
S. T. Nishimura	475	Flows.	.....	Webster, 3 miles northeast.
L. Onisha	615	Flows.	.....	Webster, 1 mile north.
R. Onisha	470	Flows.	.....	Do.
R. Bruce	500	Flows.	.....	Webster, 3 miles east.
J. A. Caplen	450	Flows.	.....	Webster, ¼ mile northeast.
Railroad Co	650	Flows.	.....	Genoa.
City	600	Flows.	.....	Do.
H. Bohen	90	Flows.	.....	Genoa, 2 miles north.
Sam Allen	250	Flows.	.....	Genoa, 2 miles south.
Do	250	Flows.	.....	Genoa, 4 miles south.
Col. Burnett	700	Flows.	3	Genoa.
Van Meter	300	Flows.	.....	Genoa, 1 mile south.
H. D. Allen	660	Flows.	.....	Seabrook, 3 miles northeast.
J. G. Todd	640	Flows.	.....	Seabrook, 1¼ miles northeast.
Alf Palm	670	70	3	Seabrook, ¾ mile northeast
City	660	Flows.	.....	Seabrook.
Townsite Co. (4 wells)	440–500	Flows.	3	La Porte.
Clark & Co	440	350	6	Do.
Tom Jennings	380	170	4	La Porte, Spillway Island.
Galveston, Houston and Northern R. R	450	Flows.	.....	Strange.
Do	450	Flows.	.....	Do.
Tud Allen	.....	Flows.	.....	Morgan Point.
N. A. Baker	440	Flows.	.....	Do.
Q. A. Wooster	217	Flows.	.....	Wooster, 1 mile west.
W. E. Jones	330	Flows.	.....	Deepwater.
Do	340	Flows.	.....	Deepwater, 1 mile north.
Do	340	Flows.	.....	Deepwater, 1¾ miles north.
Do	340	Flows.	.....	Deepwater, 2 miles north.
Do	330	Flows.	.....	Deepwater, 1 mile southeast.
Col. Hill	230	Flows.	.....	Deepwater, 1 mile northeast.
Wright	300	Flows.	.....	Deepwater, 2 miles northwest.
L. Ziemke	300	Flows.	.....	Do.
P. H. West	344	Flows.	.....	Deerspark.
A. G. Howell	324	Flows.	.....	Do.
Southern Pacific R. R	330	Flows.	.....	Do.
Public well	290	Flows.	.....	Pasadena.
H. E. Halladay	310	Flows.	.....	Do.
Dr. McNyder	180	Flows.	.....	Do.
I. L. Pitts	210	Flows.	.....	Do.
Chas. D. Allen	659	100	.....	Harrisburg, 1 mile east.
M. Davidson	500	Flows.	.....	Alameda, 1.5 miles north.
G. Dogg	450	Flows.	.....	Alameda, 3.5 miles east.
F. E. Markley	65	Flows.	.....	Aldine, ¾ mile northeast.
Kellogg	400	Flows.	.....	Aldine, 4 miles southeast.
C. W. Hahl	240	Flows.	.....	Aldine, 5 miles northwest.
Do	280	Flows.	.....	Aldine, 4 miles west.
B. F. Smith	88	Flows.	.....	Barker, 2 miles south
Fort Smith	180	Flows.	.....	Addicks, 3 miles southwest.
H. F. V. Blender	500	Flows.	.....	Humble.
Magnolia Brewery Co	150	35	.....	Houston.
Do	300	209	.....	Do.
Do	200	104	.....	Do.
Do	500	249	.....	Do.
Do	500	250	.....	Do.
Do	500	490	.....	Do.
Do	800	Flows.	.....	Do.
American Brewery Co	180	40	.....	Do.
Do	242	125	.....	Do.
Do	339	75	.....	Do.
Do	800	95	.....	Do.
Do	570	45	.....	Do.
Do	830	175	.....	Do.

Artesian wells of waterworks at Houston, Harris County.

No.	Depth.	Diameter.	No.	Depth.	Diameter.	No.	Depth.	Diameter.
	Feet.	*Inches.*		*Feet.*	*Inches.*		*Feet.*	*Inches.*
1	140	15	20	183½	4	38	325	10
2	140	6	21	314	8	39	684	12
3	80	6	22	703	8	40	211	8
4	140	15	23	692	8	41	319	8
5	140	15	24	192	6	42	720	7
6	140	15	25	204	6	43	806	8
7	140	15	26	802	8	44	496	8
8	154	6	27	1,170	8	45	800	8
9	312	8	28	814	8	46	1,185	12
10	328	6	29	502	10	47	2,018	.....
11	130	6	30	1,165	12	48	1,214	8
12	328	4	31	317	8	49	1,305	8
13	292	8	32	319	12	50	1,280	8
14	292	8	33	823	10	51	936	8
15	460	8	34	1,185	9	52	936	8
16	460	6	35	1,171	12	53	501	8
17	564	8	36	292	8	54	828	8
18	115	6	36	314	12	55	635	8
19	493	8	37	1,173	12			

Record of well No. 28, Houston, Harris County.

	Feet.
Surface soil	0– 30
Clay	30– 44
Sand and rock	44– 74
Clay	74– 89
Sand and gravel	89– 93
White clay	93–137
Sand	137–210
Clay and gravel	210–290
White sand and gravel, water bearing; hard to finish	290–316
Clay and gravel	316–356
Red sand	356–393
Clay and gravel	393–456
White clay and gravel	456–496
Sand, clay, and gravel	496–514
Sand	514–526
Gravel	526–532
Clay	532–570
Limestone	570–571
Sand and gravel	571–585
Clay	585–600
Hard rock	600–602
Clay	602–608
Sand	608–618
Clay	618–658
Clay and gravel	658–668
Sand	668–678
Clay and sand	678–687
Sand	687–705
Clay and gravel	705–745
Sand	745–756
White clay	756–772
Water-bearing sand	772–814

Record of deep well at Houston, Harris County.

	Feet.
Clay and sand	0 – 154
Sand, water bearing	154 – 161
Clay	161 – 163
Sand	163 – 210
Clay	210 – 280
Sand	280 – 312
Clay	312 – 345
Rock	345 – 345½
Sand	345½ – 350
Clay	350 – 415
Sand	415 – 420
Clay	420 – 465
Sand	465 – 502
Clay	502 – 540
Sand	540 – 570
Clay	570 – 605
Sand and gravel	605 – 643
Clay	643 – 670
Sand and gravel	670 – 702
Clay	702 – 745
Sand	745 – 769
Clay	769 – 779
Sand	779 – 805
Clay	805 – 810
Sand	810 – 835
Clay	835 – 895
Sand	895 – 940
Clay	940 –1, 134
Rock	1, 134 –1, 137
Sand	1, 137 –1, 179
Clay	1, 179 –1, 236
Sand	1, 236 –1, 314
Rock	1, 314 –1, 315
Clay	1, 315 –1, 334
Sand	1, 334 –1, 368
Clay	1, 368 –1, 430
Sand and gravel	1, 430 –1, 470
Clay and rock	1, 470 –1, 600
Rock with gas	1, 600 –1, 605
Clay	1, 605 –1, 895
Sand	1, 895 –1, 907
Clay	1, 907 –2, 025

GALVESTON COUNTY.

Shallow wells.—In Galveston County the average depth of shallow wells is 25 feet.

Artesian wells.—The log of the deep well at Galveston, bored about 1892, clearly indicates that artesian water could be found in the coast region at much shallower depths than that reached by this boring. The record down to the water-bearing sand is given below. There are at present about 90 artesian wells in Galveston County. Their

approximate location is shown in Pl. II. The most important group of these wells is located 18 miles from Galveston, at Alta Loma, where 30 wells have been drilled on both sides of the Santa Fe Railway track. The original contract for these wells specified that 33 wells should be bored and a supply of 5,000,000 gallons every twenty-four hours guaranteed. When 30 wells had been sunk, the yield was 9,000,000 gallons every twenty-four hours, 4,000,000 gallons more than the contract amount. The wells are located in a line that trends nearly north and south, and there are about an equal number on each side of the railroad track. They are provided with pipes that connect with mains to a standpipe on the north side of the track. The wells are about 868 feet deep, and all receive their water from a bed of water-bearing sand 128 feet thick, which rests upon a layer of hard clay. This water horizon was encountered in all wells at a depth of 740 to 750 feet, but some were not bored through the water-bearing sand. The following table shows the depths of wells on the south side of the railroad:

Partial list of wells at Alta Loma, Galveston County.

No.	Depth.	Diameter.	No.	Depth.	Diameter.	No.	Depth.	Diameter.
	Feet.	*Inches.*		*Feet.*	*Inches.*		*Feet.*	*Inches.*
2	792	7	12	788	5	22	726	5
4	868	7	14	800	5	24	733	5
6	793	7	16	838	5	26	745	9
8	809	5	18	790	5			
10	792	5	20	775	5			

Record of well at Alta Loma, Galveston County.[a]

	Feet.
Surface soil	0– 4
Clay	4– 12
Quicksand	12– 18
Very red clay	18– 25
Red quicksand	25– 35
Clay	35– 37
Quicksand	37– 40
Red and white clay	40–100
Sand, water bearing; no flow	100–123
White clay	123–150
Red clay	150–173
Very hard red clay	173–190
Hard and soft clay	190–208
Soft red clay	208–218
Hard clay	218–230
Quicksand	230–385
Hard and soft white clay	385–435
Soft white clay	435–478
White sand and clay	478–488
Very hard shell rock	488–489
White water-bearing sand; first flow	489–494

[a] Information furnished by E. H. Stobard.

	Feet.
Hard white clay	494–500
Soft white clay	500–514
Hard and soft white clay	514–560
Hard white clay	560–590
Quicksand	590–611
Hard clay	611–620
Soft clay	620–631
Hard and soft clay	631–703
Sand and clay	703–735
Hard white clay	735–740
Sand, water bearing	740–868
Hard red clay	868–

Artesian wells in Galveston County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	Feet.	*Gallons.*	*Inches.*	
D. Collogue	640	200	.....	Dickinson.
W. H. Crawford	675	(*a*)	8	Dickinson, 1 mile east.
J. D. Ward	700	.....	6	Dickinson, 2½ miles east.
C. C. Pellit	620	4	6	Dickinson, 2 miles east.
F. Fonts	600	10	6	Dickinson, 1 mile south.
John Williams	750	(*b*)	6	Dickinson, 2 miles north.
Sam Saloets	550	2	.....	Dickinson, ½ mile northeast.
Charles Engelke	700	(*a*)	.....	Dickinson, 1½ miles east.
Mick Weeks	675	100	.....	Dickinson, ¼ mile southwest.
Joe Lohit	640	100	.....	Dickinson.
Do	640	100	.....	Do.
Do	640	100	.....	Do.
Charles Nolan	600	.....	.....	Dickinson, 1 mile south.
Do	650	.....	.....	Dickinson, 2½ miles south.
C. H. Collier	.....	.....	.....	Dickinson, ¼ mile south.
Nicolini	640	.....	.....	
R. A. Walker	750	40	.....	League City.
A. W. Wilkerson	550	40	.....	Do.
Do	530	40	.....	Do.
J. C. League	526	40	.....	Do.
C. R. Reifel	562	25	.....	Do.
Do	410	25	.....	Do.
Mrs. L. Cours	420	20	.....	Do.
Mrs. R. T. Wheeler	690	57	2	Hitchcock, ½ mile east.
Do	763	80	3	Hitchcock, ½ mile north.
A. H. Tacquard	406	80	4½	Hitchcock, 8 miles west.
Do	300	25	3	Hitchcock, 7 miles west.
Do	306	30	2	Hitchcock, 6 miles west.
Do	60	10	2	Hitchcock, 7 miles west.
Do	88	12	2	Hitchcock, 8 miles west.
Do	88	12	2	Do.
Jacques Tacquard	763	25	3	Do.
Do	180	15	2	Do.
A. H. Tacquard (home)	710	100	3	Hitchcock, 1½ miles west.
A. H. Tacquard (pasture)	720	80	3	Hitchcock, 2 miles southwest.
Jules Perthius	230	25	3	Hitchcock, 2 miles east.
Do	495	65	3	Do.
W. F. Reitmeyer	433	10	2	Hitchcock, 1½ miles west.
Do	420	80	3	Do.
J. Jinsen	500	48	3	Hitchcock, 1 mile east.
J. A. Minot	763	64	2	Hitchcock, ½ mile south.
David Tahey	576	68	3	Hitchcock, 1½ miles east.
B. F. Fast	702	120	3	Hitchcock, 2½ miles west.
Gulf, Colorado and Santa Fe R. R.	720	78	3	Hitchcock, 100 yards east.
J. H. Kemper	600	60	3	Hitchcock, 1 mile east.
Alta Loma Co	914	40	3	Hitchcock, 4 miles northwest.
Galveston, Houston and Henderson R. R.	867	700	10	Hitchcock, 4 miles east, at La Marque.
W. McClintoc	630	50	4	Bay View.
Galveston, Houston and Northern R. R.	600	55	3	Edgewater.
J. R. Myers	725	70	4½	Texas City.
Inman Compress Co	912	70	4½	Do.
South Galveston Land Co	640	40	3	Middle of island.
Do	644	40	3	Do.
Galveston Brewing Co	872	Flows.	8	

a Water rises 10 feet above surface. *b* Water rises 8 feet above surface.

Record of deep well at Galveston.

	Feet.
Pleistocene:	
Gray to buff sand	0– 46
Reddish-brown clay containing lenses of sandstone, quartz pebbles, nodules of dark-gray clay, and shell fragments	46– 63
Mottled red and blue clay containing shell fragments and in lower part lignitic material	63–100
Gray sandy clay	100–110
Fine gray sand with fragments of lignite	110–167
Buff-colored sandy clay	167–279
Fine gray sand with fragments of lignite	279–305
Grayish-brown clay with fragments of lignite	305–315
Fine sand, gray to buff, with fragments of lignite throughout bed and lower 35 feet slightly micaceous	315–440
Grayish-brown clay with fragments of lignite, shells, corals, and claw of crustacean	440–458
Age doubtful:	
Gray sandy clay, slightly micaceous	458–468
Brownish-gray sandy clay	468–497
Fine light-gray clayey sand, micaceous	497–575
Brownish-gray sandy clay	575–592
Gray sand, micaceous	592–612
Brownish sandy clay with shell fragments	612–647
Light-gray sandy clay	647–674
Reddish-brown sandy clay with shell fragments	674–706
Buff-colored sand, slightly micaceous	706–720
Brownish-gray clayey sand	720–737
Light-gray clayey sand, the lower 11 feet containing a few shell fragments and large pieces of lignite	737–827
Coarse silver-gray sand, composed of angular fragments of translucent and smoky quartz not much water-worn (the water-bearing sand from which most of the city's water supply was derived previous to the utilization of the Alta Loma wells)	827–882

This well was drilled to a depth of 3,070 feet, but practically no water-bearing sand of importance was found below 882 feet. The complete record is published in the Twenty-first Annual Report of the U. S. Geological Survey, part 7, pages 402–405.

CHAMBERS COUNTY.

Shallow wells.—Beneath the surface soil in Chambers County there is a bed of sand which extends to a depth of 30 feet or more. In its lower part this sand contains an abundance of excellent water which is the source of supply for all shallow wells in the region.

Artesian wells.—There are 17 artesian wells in Chambers County and their approximate location is indicated in Pl. II. At many places artesian water has been obtained, but it is salty in many cases, especially in wells near the bay.

Artesian wells in Chambers County.

Owner.	Depth.	Flow per minute.	Location.
	Feet.	*Gallons.*	
E. W. Barber	800	Flows.	Mount Belvieu.
Mat Fisher	550	Flows.	Mount Belvieu, 10 miles south.
J. C. Fisher (estimate) [a]	500	Flows.	Cedar Bayou.
Dr. N. Schilling	700	Flows.	Do.
Do	700	Flows.	Do.
Barney Donelly	375	Flows.	Mount Belvieu, 3 miles south.
Amos Lawrence	500	Flows.	Mount Belvieu, 5 miles south.
C. R. Cummings Co	400	Flows.	Anahuac, 4 miles north.
Do	400	Flows.	Do.
John Cook	380	Flows.	Wallisville.
W. D. Wilcox	850	35	Anahuac, Turtle Bayou.
J. T. White [a]	1,720	Flows.	
D. L. Broussard	850	100	Double Bayou.
Sol. Brown	800	100	Do.
Hugh Jackson		100	Double Bayou, 15 miles southeast.
James Jackson	1,000	100	Double Bayou, 15 miles northeast.
—— Davidson	600	100	Near Stowell.

[a] Water salty.

JEFFERSON COUNTY.

Shallow wells.—The wells of Jefferson County are very shallow, ranging from 6 to 15 feet in depth. Many of those 6 feet deep furnish an abundance of water.

Artesian wells.—Information has been obtained of about 31 artesian wells in this county, but such wells are not generally successful. Many of them have feeble flows, making it necessary to employ pumps to increase the discharge, while in other cases, where the flows are sufficiently large, the water is more or less salty. A large number of wells have been drilled for oil in the vicinity of Spindletop, south of Beaumont. The following is a list of artesian wells in Jefferson County, with other data concerning them. A record of the Stribling well is also given.

Artesian wells in Jefferson County.

Owner.	Depth.	Flow per minute.	Location.
	Feet.	*Gallons.*	
W. C. Tyrrell	180	Slight.	
H. De Mondrot	430	25	
Port Arthur	450	40	
McKinney	620	Slight.	
Jefferson Rice Co	530	Slight.	
Jes Garland	450	65	
J. W. Denny	260	Slight.	
H. C. Wheeler (5 wells)	230	Slight.	Hampshire, 1½ miles south.
D. N. Coffol	306	25	
A. J. Snouffer	180	25	Hampshire, 1½ miles north.
Do	200	25	
C. T. Heisig	230	Slight.	
Do	180	No flow.	
Do	150	No flow.	
Doctor Price	190	Slight.	
H. Aldridge	135	Slight.	
Geo. J. McManis	180	20	Stowell, 2 miles east.
H. Aldridge	135	Slight.	
Geo. J. McManis	178	20	
Do	267	20	
Do	180	20	
Do	653	45	
R. P. Carroll	280	25	
Court-house [a]	745	30	
Natatorium [b]	796	150	Port Arthur.
Hotel [b]	1,065	100	Sabine Pass.
J. F. Keith [c]	534	10	Beaumont.

[a] Diameter, 3 inches. [b] Diameter, 4½ inches. [c] Diameter, 6 inches.

Record of Stribling well, Sabine Pass, Jefferson County.

	Feet.	
Red clay	0–	16
Red sand	16–	20
Red clay	20–	60
White sand	60–	80
Red clay	80–	140
Coarse sand	140–	170
Blue clay	170–	185
White sand	185–	220
Soft blue clay	220–	236
Fine white sand	236–	250
Hard blue clay	250–	260
White sand	260–	270
Blue clay	270–	355
White sand	355–	426
Blue clay	426–	442
Interbedded sand and clay	442–	500
White sand	500–	600
White sand with gravel at bottom	600–	636
Blue clay with streaks of sand	636–	740
Sand	740–	764
Sand and coarse gravel, all colors	764–	795
Hard sandstone	795–	796
Blue shale	796–	854
Hard sandstone	854–	855½
Blue shale	855½–	892
Sandstone	892–	893
Fine white sand	893–	960
Soft blue clay	960–	1,000
Fine white sand	1,000–	1,260
Blue and white shale	1,260–	1,270
Fine white sand	1,270–	1,360
White and blue clays	1,360–	1,450
White sand	1,450–	1,490
Solid white and blue shale	1,490–	1,500

ORANGE COUNTY.

Shallow wells.—The deepest of the shallow wells of Orange County are about 22 feet in depth, and a large supply of water is usually obtained.

Artesian wells.—There are a few artesian wells at Orange, varying in depth from 400 to 800 feet. Their flows are moderate, but few exceeding 50 gallons a minute. A partial list of these wells is given below:

Artesian wells in Orange County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	Feet.	*Gallons.*	*Inches.*	
J. W. Link	600	15	.....	Orange.
Do	467	21	4	Do.
High school	467	22	3	Do.
Do	500	10	.....	Do.
Electric-light plant	650	.....	.....	Do.
Ice plant	480	52	6	Do.
Sam Wilson	800	Slight.	.....	Orange, 9 miles northwest.
W. A. Fletcher	740	60	6	8 miles from Beaumont.
Texas and New Orleans Railroad	396	.....	8¾	Echo.
Do	435	35	6	Echo, 1 mile from Sabine River.

ZAPATA COUNTY.

Shallow wells.—Shallow wells are difficult to obtain in the northern part of Zapata County. Near the Rio Grande and along the eastern part of the county water can be obtained at moderate depths, but in the lower lands the depths of the wells vary from 100 to 250 feet.

Artesian wells.—No information has been received concerning the artesian conditions of this county.

DUVAL COUNTY.

Shallow wells.—Wells in Duval County can be obtained at depths varying from 50 to 300 feet.

Artesian wells.—No artesian wells have been reported from Duval County. Artesian water is found, however, in the southern part of Nueces County, in the northeastern part of Starr County and at Bruniville, on the Texas and Mexican Railroad, in the eastern part of Webb County. The northern part of Duval County lies between two artesian districts; that at Kingsville, Nueces County, and that at Artesia, Lasalle County. Artesian water is also obtained in the region about 30 miles north of the northern boundary of Duval County.

LIVE OAK COUNTY.

Shallow wells.—Shallow-well water is obtained in the southern and eastern parts of Live Oak County, at depths of 100 to 120 feet; in the western part at about 200 feet, and in the northern part at 300 feet.

Artesian wells.—Artesian water is found in the northern part of this county. The following table gives a list of the artesian wells:

Artesian wells in Live Oak County.

Owner.	Depth.	Flow.	Location.
	Feet.		
Geo. W. West	155	Slight	Oakville, 13 miles northwest.
Do	226	Slight	
Thos. R. T. North	375	Small	Oakville.
C. T. Tom	450	(a)	Oakville, 18 miles northwest.
Mrs. B. McGloin	150	Flows	Near Mikeska.

[a] Water at 6 feet below surface.

BEE COUNTY.

Shallow wells.—In the northern and southern parts of Bee County wells have an average depth of about 40 feet, in the eastern part about 70 feet, and in the western part about 100 feet.

Artesian wells.—No information has been obtained regarding the artesian condition of this county. There are at present no artesian wells in Bee County.

GOLIAD COUNTY.

Shallow wells.—In Goliad County water is found in shallow wells at depths varying from 50 to 125 feet.

Artesian wells.—There are no artesian wells in this county. On the ranch of T. M. O'Connor, 6 miles south and 20 miles east of Goliad, on the head of Little Carco Creek, a boring was made to a depth of 1,446 feet, but no artesian water was obtained.

KARNES COUNTY.

Shallow wells.—In Karnes County a good supply of water is obtained from shallow wells having the following average depths: In the northern part, 60 feet; in the eastern part, 80 feet; in the southern part, 90 feet; in the western part, 120 feet.

Artesian wells.—There are at present no artesian wells in Karnes County. At Karnes City a test well was sunk to a depth of 1,800 feet, but no artesian water was found. It is possible that more extensive prospecting in other parts of the county may result in the discovery of flows at shallower depths.

DEWITT COUNTY.

Shallow wells.—Throughout Dewitt County shallow wells are obtained at an average depth of about 55 feet. The principal water supply appears to lie in sheets, so that the depths of the wells vary according to the elevation of the surface.

Artesian wells.—The only artesian water thus far obtained in Dewitt County is at Yorktown and Yoakum. At Yorktown there were formerly 8 or 10 small artesian wells, flowing 5 gallons a minute and varying in depth from 50 to 60 feet, but at present only two of these flow, the others having been allowed to cave in or to become choked with sand at the bottom. The two wells which continue to flow are in the bed of Yorktown Creek. Many of the wells in the town show a strong artesian tendency, the water rising within 10 feet of the surface. At Yoakum several deep wells have been drilled and in nearly every case the water rises within a few feet of the surface, but no wells are recorded in which flows were obtained. In the deepest well, 1,300 feet deep, the water is soft, relatively pure, and admirably suited for general domestic uses. It is noncorrosive and well adapted to boiler purposes. According to some analyses it contains only 42 grains of solid matter per gallon and no organic matter.

Record of H. G. Brown's artesian well, 7½ miles southwest of Cuero, Dewitt County.

	Feet.	
Red and yellow clay, with cobblestone	0 –	60
Hard rock, fine grained	60 –	120
Water-bearing sand	120 –	121
Gravel and clay, hardpan	121 –	181
Very hard gritty rock	181 –	202
Sandstone	202 –	365
Yellow clay and hard rock	365 –	490
Sand, water bearing	490 –	690½
Stratified rock	690½ –	710
Red, white, and blue clay	710 –	805
"Talc," with an occasional layer of red and blue clay	805 –	1,050
Pale-blue "talc;" strong indications of water	1,050 –	1,100
Clear glassy rock, soluble in acid; slacks if exposed to the air	1,100 –	1,130

GONZALES COUNTY.

Shallow wells.—The shallow wells of Gonzales County show considerable variation in depth, ranging from 20 to 80 feet.

Artesian wells.—In the western part of Gonzales County the artesian water resources have been extensively developed. There are 125 artesian wells in the vicinity of Leesville, Rancho, and Wrightsboro. They vary considerably in depth, ranging from 100 to 700 feet, and their maximum flow is 100 gallons a minute. The average flow, however, is much less than this, as shown in the following table, which contains a partial list of these wells, with their depth, flow, and approximate location.

Artesian wells in Gonzales County.

Post-office and owner.	Distance and direction from post-office.	Depth.	Flow per minute.
		Feet.	*Gallons.*
Wrightsboro:			
J. G. Barnett	2 miles southwest	640	40
R. R. Hinton	1½ miles northwest	420	10
W. T. Mahon	2 miles west	363	25
Do	2½ miles northwest	400±	0
W. B. Houston	3 miles southwest	316	10
Do	....do	408	36
H. G. Barnett	3 miles northwest	347	0
J. D. Tankersley	¾ mile northeast	269	20+
Dewet:			
J. D. Tankersley	1 mile northeast	290±	10+
W. L. Caraway	100 yards south	313	5+
Do	½ mile southeast	200±	3+
J. R. Keadings		311	5
John Worthy	¾ mile west	528	7
F. M. Caraway	1½ miles northeast	500±	5
John Caraway	1½ miles northeast	260±	5
M. V. Caraway	1 mile southwest	300±	6
Albert Tankersley	½ mile northeast	268±	15
E. O. Perkins	¾ mile south	231	6
Leesville:			
Jay Mahan [a]	3 miles southeast	222	6
Do	....do	527	5
W. F. McGlasson [b]	....do	176	4
C. C. Littlefield	1½ miles south	600±	2
Do	2 miles northwest	360±	50
Do	3 miles west-northwest	350±	75
Do	2 miles west	212	25
Do	1¼ miles northwest	284	5
Do	2 miles west	216	30
John Bratton	½ mile southwest	470±	0
Do	1 mile south	250±	10
Jno. Glazier	½ mile southwest	448	10–
F. C. Baker	1 mile northeast	500±	40
W. M. Carr	1½ miles north	439	20
Gus Scofje	2½ miles north	400±	5
Otto McNemar	2 miles north	435	30
J. A. Williams	2½ miles north	480±	1
K. J. Hawkins	2 miles north-northeast	400±	5
J. E. Martin	1 mile southwest	290±	1
Davenport	4 miles west-northwest	250±	10
J. B. Wells	1¾ miles north	185	5
Do	3 miles northwest	200±	40
Do	3+ miles northwest	180	5
Do. [c]	2 miles northwest	200±	50
Do. [d]	2½ miles northwest	200±	100
Do. [e]	2¾ miles northwest	200	40
Do. [f]	1½ miles northwest	200	50
Do	2½ miles north	250	5
Do. [d]	3¼ miles north	350	100
Do	3½ miles north	350	100
Do. [e]	3 miles north-northwest	200	50
Do	....do	350	25
S. A. Brown	200 yards north	441	25
W. H. Brown	400 yards east	504	20
Do	300 yards east	643	40
Do	600 yards north	450	35
F. M. Caraway	50 yards west	460	40
J. G. McGuffin	250 yards southwest	143	5
S. A. Hubbard	150 yards southwest	160	10
Doctor Littlefield	75 yards south	166	15
Do	50 yards west	160	15
Do	750 yards south	490	30
J. P. Watkins	500 yards southwest	160±	7
I. A. Pruett	200 yards east	250±	6
Dr. J. M. Fly	100 yards northeast	170±	5
Do	135 yards northeast	170±	5
A. B. Holmes	400 yards west	488	15
Geo. Brown	500 yards north	450±	8
Geo. Williams	350 yards west	200±	10
J. C. West	300 yards northeast	450	18
J. M. Caraway	200 yards northeast	170	5
Sol. Gordon	5 miles southwest	420	20
W. H. Brown	6 miles southwest	450	10
Gus Varner	6 miles west	350	7
Rancho:			
H. Wicke	½ mile northeast	180	15
Do	1 mile northeast	297	5
W. M. Mangum	½ mile east	500	10
Do	2 miles north	300	20

[a] First water at 135 feet; second at 222.
[b] Four wells with 4-inch pipe casing.
[c] Casing, 3-inch pipe.
[d] First water.
[e] Casing, 6-inch pipe.
[f] Casing, 4-inch pipe.

Artesian wells in Gonzales County—Continued.

Post-office and owner.	Distance and direction from post-office.	Depth.	Flow per minute.
Rancho—Continued.		*Feet.*	*Gallons.*
W. M. Mangum	1 mile east-northeast	185	30
James Pace	3 miles east	360	5
Doctor Green	1¼ miles northeast	420	20
Do	do	175	10
Do	3 miles northeast	400	12
Do	½ mile northeast	325	15
W. T. Davis	250 yards	509	10
W. J. New	200 yards east	450	6
I. W. Littleton	1 mile northwest	140	10
J. R. Murray	400 yards north	130	4
Paul Murray	1 mile north	180	10
Mrs. Murray	500 yards southeast	230	5
S. W. Magee	100 yards south	475	15
W. A. Williams	1½ miles north	300	5
G. P. McDonald	1½ miles north-northwest	280	5
J. T. Nixon	1 mile southwest	400	6
George McPeters	½ mile northwest	117	7
J. H. Patterson	1 mile east	270	10
Mrs. C. E. Hall	½ mile northeast	300	1
D. C. Hall	600 yards northeast	350	25
Do	2½ miles northeast	450	10
Miller & Sayers	100 yards east	385	20
W. H. Magee	4½ miles east-northeast	430	15
F. Weinert	5 miles southwest	406	10
J. D. Houston	3½ miles south	420	15
J. L. Weber	4 miles southeast	537	3
Geo. Parks	3 miles southeast	531	40
Do	4 miles southeast	505	30
Frank Clark	1½ miles east	400	7
W. B. Clark	1¾ miles east	300	5
S. W. Fanning	2½ miles east-northeast	260	15
M. G. Fanning	3 miles east-northeast	225	13
Jeff Patterson	3¼ miles east	337	6
Do.[a]		450 700	25 10

[a] This well has two casings, one inside the other. The outer is 450 feet deep and furnishes salt water (25 gallons) and gas. The inner is 700 feet deep and furnishes good water.

The following is the record of a representative artesian well, situated on the Gentry ranch, on Sandy Fork of Peach Creek, 12 miles northeast of Gonzales.

Record of Charles Gentry's artesian well, Gonzales County.

	Feet.
Clay and flint bowlders	0 – 45½
Rock	45½– 46
Blue sand and clay	46 – 68
Blue clay, very little sand	68 –157
Hard sandstone, fine grained (10 inches of water sand at this depth; trace of oil; lignite plentiful)	157 –195
Sand, water and oil bearing	195 –195¾
White quartz	195¾–196½
Sandstone, hard, fine grained (trace of oil)	196½–218
Blue clay	218 –220
Sandstone (trace of oil)	220 –222
Black clay, containing decayed wood	222 –228
Sandstone (trace of oil)	228 –263
Blue marl	263 –285
Quartz	285 –286
Blue marl, spongy	286 –304
Shale with soft strata	304 –321
Hard blue sandstone	321 –339

	Feet.
Hard cement rock	339–378
Clay, sand, and shell	378–380
Rock	380–381
Clay, sand, and shell	381–383
Hard rock	383–384
Clay and sand (trace of oil)	384–405
Dark blue clay and sandstone	405–406
Clay and sand	406–410
Clay and shell	410–463
Clay, little shell; thin hard rock at intervals	463–501
Shells and clay	501–579
Clay and shell (water bearing)	579–708
Hard rock	708–709

LAVACA COUNTY.

Shallow wells.—An abundance of water is obtained in Lavaca County from wells which vary in depth from 30 to 40 feet.

Artesian wells.—A number of good artesian wells have been obtained in Hallettsville and the surrounding country. In the wells at Hallettsville two flows have been found, one at 300 feet and the other at 560 feet below the surface. The oil-mill well encountered the first flow at 320 feet, which furnished a supply of 45 gallons per minute, while the second flow at a depth of 560 feet furnished 88 gallons a minute. At Shiner a flowing well was obtained at a depth of 90 feet, which yielded 79 gallons a minute. The well was located on low ground and the water rose 6 feet above the surface. Several attempts to obtain water from this horizon on higher ground, in the vicinity of Shiner, have been unsuccessful, one boring being continued to a depth of 700 feet without striking a flow. The following is a list of the artesian wells in this county:

Artesian wells in Lavaca County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	Feet.	*Gallons.*	*Inches.*	
City	600	30	4	Hallettsville.
Do	560	89	4	Do.
Do	325	45	4	Do.
Do	980	140	4	Do.
Oil mill	560	30	4	Do.
Ice factory	340	30	.....	
J. Keusler	768	.....	4	Breslau.
C. Pagelest	340	30	4	Hallettsville, 4 miles north.
Trautwine & Walters	90	25	4	Shiner.
Unknown	700	Failure.	.....	Do.
Oil Company	1,500	....do....	.....	Hallettsville, 7 miles southeast.

FAYETTE COUNTY.

Shallow wells.—Water in sufficient quantity for general domestic purposes is found in the northern and western parts of Fayette County at average depths of 60 feet, in the southern part at depths of 75 to 100 feet, and in the eastern part at depths of 40 to 75 feet.

Artesian wells.—There are 20 artesian wells in this county, including a few deep ones; the area in which the greatest number has been drilled lies north of Engle. The average depth of these wells varies from 200 to 300 feet and the maximum flow is 100 gallons a minute. The following is a list of the wells, including their depth, flow, and other data:

Artesian wells in Fayette County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	Feet.	*Gallons.*	*Inches.*	
John Sima	196	25	3	Praha.
Mrs. Vyvjala	216	15	3	Do.
Do	220	50	3	Do.
J. A. Drozd	210	10	3	Do.
J. Kalich	210	18	3	Engle, 2 miles northwest.
M. Schwenke	185	16	3	Do.
J. Sulak	165	10	3	Do.
J. Ladewig	200	10	2	Do.
Compress Co	260	[a] 40	6	Schulenburg.
C. Baumgartner	258	[a] 87	6	Do.
W. A. McKinsen	267	[a] 43	5	Do.
H. P. Schaeffer	300	[a] 79	3	Do.
G. Hoeffers	275	[a] 54	3	Do.
C. Blaschke	300	[a] 79	3	Do.
Southern Pacific R. R	762	[b]	10	Do.

[a] No flow; water rises to number of feet stated below surface of ground. [b] Well caved in.

COLORADO COUNTY.

Shallow wells.—Shallow wells in Colorado County are about 40 feet deep in the northern and western parts, 35 feet in the southern part, and 30 feet in the eastern part. East of Eagle Lake there are a number of wells 30 to 35 feet deep, which furnish a large supply of good water. Two wells supply water for 100 acres of rice, each acre of which requires 9 gallons a minute, and it is generally believed that a good rice well can be obtained at moderate depths in this county at any point east of Eagle Lake.

Artesian wells.—So far as known the only artesian well in Colorado County is located on the west bank of Colorado River at Columbus. This well was bored by the city for water supply, and it has maintained a steady but small flow for years. The water contains a small amount of gas. The record of this well is given below:

Record of artesian well at Columbus, Colorado County.

	Feet.
Sand and gravel	0– 29
Soft rock	29– 37
Fine gravel	37– 41
Blue gravel	41– 54
Yellow clay	54– 99
Hard rock	99–101
Yellow clay	101–104
Conglomerate rock	104–110
Yellow clay	110–190
White sand, water bearing	190–198
Yellow clay	198–210
Hard bowlders	210–212
Yellow clay	212–214
Red sandstone	214–220
Yellow clay	220–221
Soft rock	221–223
Yellow clay	223–226
Concrete rock	226–233
Light-red clay	233–280
Bowlder bed	280–281
Yellow clay	281–283
Bowlder rock	283–285
Yellow clay	285–289
Yellow sandstone	289–290
Yellow clay	290–302
Hard sandstone	302–304
White clay	304–309
Red sandstone	309–311
Light-yellow clay	311–319
Yellow sandstone	319–321
Yellow clay	321–412
Slate and clay	412–454
Red, white, and blue clay	454–583
Blue sand; flowing water, 8 gallons a minute	583–600
Hard blue clay	600–620
Fine blue sand; flowing gas	620–633
Shells and old logs	633–637
Blue clay	637–658
White pottery clay	658–675
Fine white sand; flowing water	675–683
Red and blue clay	683–730
Hard rock	730–739
Hard blue clay	739–793
Fine blue sand, hard	793–807

Fine rock (bored into 19 feet).

AUSTIN COUNTY.

Shallow wells.—A good supply of water is obtained from shallow wells in the western part of Austin County at an average depth of 30 feet; in the southern part at 40 feet, in the eastern part at 60 feet, and in the northern part at about 50 feet.

Artesian wells.—No artesian wells have been reported from this county, although it is probable that they can be obtained along Brazos River.

WALLER COUNTY.

Shallow wells.—In Waller County shallow wells vary in depth from 35 to 50 feet.

Artesian wells.—Only a few artesian wells have been drilled in Waller County, the data of some of which are tabulated below. The most successful free-flowing wells are found near Brazos River.

Artesian wells in Waller County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	Feet.	*Gallons.*	*Inches.*	
Waterworks	1,132	110	4½	Hempstead.
Heber Stone	485	40	1	Hempstead, 5 miles northwest.
Rufus Hardy	850	15	1	Hempstead, 6 miles south.
J. C. Ralston	1,700	.....	.....	Waller, 4 miles south.

WASHINGTON COUNTY.

Shallow wells.—A good supply of excellent water is obtained in Washington County, at various depths, ranging from 20 to 60 feet.

Artesian wells.—Only a few artesian wells have been drilled in this county, a list of which is given below. It is probable that artesian water can be found in the eastern part of the county, in the Brazos bottom lands, but owing to the excellent supply of water from non-flowing wells few attempts have been made to develop artesian water.

A few years ago Heber Stone had a well drilled in Brenham to a depth of 1,500 feet, but no flowing water was obtained. The water rose in the well within 40 feet of the surface, and it is believed that wells penetrating the same water horizon in the Brazos bottom lands would yield flows. The city of Brenham derives its water supply from wells between 300 and 400 feet deep. The following is a list of the artesian wells in this county.

Artesian wells in Washington County.

Owner.	Depth.	Flow.	Diameter.	Location.
	Feet.		*Inches.*	
J. Balbridge	640	Flows...	.....	Gaball, 300 yards northwest.
Robert Moore	240	Flows...	2	Old Washington.
Do	700	Flows...	2	
J. P. Buchanan	500	Strong..	.....	Chapel Hill, 6 miles northeast.
John Carlisle	560	Flows...	.....	Chapel Hill, near.

GRIMES COUNTY.

Shallow wells.—Water from shallow wells is obtained in the eastern part of Grimes County at a depth of 30 feet; in the southern part, at 35 feet; in the western part, along the Navasota, at 30 feet, and in the northern part at depths of 50 to 60 feet.

Artesian wells.—Good artesian water is obtained in and around Navasota and between Navasota and Brazos River. The following table shows the artesian wells of Grimes County:

Artesian wells in Grimes County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	Feet.	*Gallons.*	*Inches.*	
R. A. Sangster	300	60	2	Navasota.
A. J. Sangster	225	+15	.....	Navasota, ¼ mile south.
Ice factory	250	+20	6	Navasota.
Mrs. Lewis Wilson	224	.....	.....	Do.
August Horst	1,000	.....	.....	Do.
City waterworks	97	.....	.....	Do.
Shumaker	101	.....	.....	
J. M. McCord	850	Strong.	4	Courtney, ½ mile southeast.
Do	900	Medium.	4	Courtney, ⅝ mile east.

Record of Navasota well, Grimes County.

	Feet.
Soil	0– 2
Clay	2– 18
Sand	18– 29
Blue clay	29– 94
Slate	94–114
Blue clay	114–216
Rock	216–220
Water sand	220–237
Blue shale	237–277
Rock	277–280

Analysis of water from deep well at Navasota, Grimes County.[a]

	Parts per million.		Parts per million.
Sodium (Na)	140.0	Carbonate radicle (CO_3)	168.0
Magnesium (Mg)	8.8	Sulphates of iron and aluminum	15.0
Calcium (Ca)	43.0	Organic matter	38.0
Chlorine (Cl)	79.0		
Sulphate radicle (SO_4)	41.0		532.8

[a] Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geol. Survey.

LIBERTY COUNTY.

Shallow wells.—Water from shallow wells is secured throughout Liberty County at depths of 15 to 25 feet.

Artesian wells.—The Gulf, Colorado and Santa Fe Railroad has deep wells at Trinity River and Cleveland. Records of these wells and analyses of their waters are given below. The following table contains a list of flowing artesian wells drilled in Liberty County:

Flowing artesian wells in Liberty County.

Owner.	Depth.	Diameter.	Distance and direction from Liberty.
	Feet.	*Inches.*	
J. T. Russell	290	.....	½ mile south.
Do	300	.....	¾ mile southeast.
Southern Pacific R. R	800	.....	300 yards southeast.
Fisher	150	.....	1 mile west.
Melon farm	240	.....	½ mile south.
Do	245	.....	Do.
Texas and New Orleans R. R	576	6	

Record of deep well at Trinity River, Liberty County.

	Feet.
Red clay	0– 8
Sand	8– 38
Clay	38– 60
Rock and clay	60–104
Quicksand	104–117
Rock	117–119
Clay	119–121
Rock	121–133
Clay	133–145
Rock	145–151
Coarse sand	151–163
Soapstone	163–194
Rock	194–196
Sand	196–203
Rock	203–210
Clay	210–220
Rock	220–240
Water sand	240–290
Clay	290–300

Analysis of water from deep well at Trinity River, Liberty County.[a]

	Parts per million.		Parts per million.
Sodium (Na)	19.0	Carbonate radicle (CO_3)	7.0
Magnesium (Mg)	4.4	Silica (SiO_2)	14.0
Calcium (Ca)	38.0	Organic matter	50.0
Chlorine (Cl)	16.0		
Sulphate radicle (SO_4)	20.0		305.4
Bicarbonate radicle (HCO_3)	137.0		

[a] Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geol. Survey.

Record of deep well at Cleveland, Liberty County.

	Feet.
Soil	0– 4
Yellow clay	4– 24
Yellow sand	24–100
Clay	100–108
Sand	108–131
Rock	131–132
Clay and coarse sand	132–140
White sand rock	140–142
Yellow clay	142–160
White sand rock	160–161
Yellow sand	161–165
White sand rock	165–166
Yellow clay	166–236
Sand	236–246
Clay	246–288
Open water sand	288–367
Rock	367–368

Analysis of water from deep well at Cleveland, Liberty County.[a]

[Analyst, W. A. Powers.]

	Parts per million.		Parts per million.
Silica (SiO_2)	27	Chlorine (Cl)	9.1
Calcium (Ca)	43	Organic matter	32
Magnesium (Mg)	30	Total solids	340
Sodium (Na)	12		
Carbonate radicle (CO_3)	74	Free carbonic acid (CO_2)	17
Sulphate radicle (SO_4)	113	Carbonic acid combined as HCO_3	63

MONTGOMERY COUNTY.

Shallow wells.—Shallow wells in Montgomery County vary in depth from 30 to 50 feet.

Artesian wells.—The Gulf, Colorado and Santa Fe Railroad has a deep well at Bobbin and an artesian well at Conroe. Records of these wells and analyses of their waters are given below.

Record of well at Bobbin, Montgomery County.

	Feet.
Soil	0– 2
Clay	2– 12
Sand	12– 28
Clay	28– 78
Quicksand	78– 90
Sandstone	90–101
Clay	101–114
Water sand	114–134
Clay	134–234
Sand	234–264
Rock	264–309
Clay	309–343

[a] Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geol. Survey.

	Feet.
Rock	343–347
Slate	347–383
Rock	383–390
Slate	390–454
Rock	454–457
Slate	457–480

Analysis of water from deep well at Bobbin, Montgomery County.[a]

	Parts per million.		Parts per million.
Sodium (Na)	90	Carbonate radicle (CO_3)	65
Magnesium (Mg)	14	Silica (SiO_2)	27
Calcium (Ca)	110	Sulphates of iron and aluminum	27
Chlorine (Cl)	167	Organic matter	70
Sulphate radicle (SO_4)	11		939
Bicarbonate radicle (HCO_3)	358		

Record of well at Conroe, Montgomery County.

	Feet.	
Red clay	0–	12
Rock	12–	13
Red clay	13–	69
Sand	69–	89
Red clay	89–	133
Hard yellow clay	133–	153
Joint clay	153–	182
Water sand	182–	193
Soft clay	193–	248
Hard clay	248–	265
Rock	265–	267
Hard clay	267–	280
Rock	280–	285
Dry sand bed	285–	297
Clay	297–	340
Rock	340–	343
Clay	343–	363
Rock	363–	365
Blue clay	365–	489
Light clay	489–	500
Soft clay	500–	575
Rock	575–	577
Water sand	577–	642
Blue clay	642–	680
Water sand	680–	740
Clay	740–	790
Soapstone	790–	831
Red clay	831–	888
Soapstone	888–	924
Clay	924–	976
Rock	976–	978
Clay	978–	1,003

[a] Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geol. Survey.

	Feet.
Rock	1,003–1,004
Sand	1,004–1,008
Red clay	1,008–1,033
Soapstone	1,033–1,073
Rock	1,073–1,075
Sand	1,075–1,125
Soapstone	1,125–1,169
Rock	1,169–1,170
Clay	1,170–1,190
Rock	1,190–1,192
Clay	1,192–1,212
Sand	1,212–1,234
Rock	1,234–1,236

Analysis of water from deep well at Conroe, Montgomery County. [a]

	Parts per million.		Parts per million.
Sodium (Na)	41	Silica (SiO_2)	21
Magnesium (Mg)	16	Organic matter	38
Calcium (Ca)	73		407
Chlorine (Cl)	48		
Carbonate radicle (CO_3)	170		

WALKER COUNTY.

Shallow wells.—Water is procured from shallow wells in Walker County at depths varying from 35 to 45 feet.

Artesian wells.—There are no artesian wells in Walker county, but it is believed that they could be obtained throughout its area. The numerous flowing streams in the county and the shallow depths at which nonflowing wells may be obtained have decreased the demand for artesian water.

SAN JACINTO COUNTY.

Shallow wells.—In San Jacinto County shallow wells vary in depth from 35 to 60 feet.

Artesian wells.—There are no artesian wells in this county. At Oakhurst, 7 miles east of Dodge, a well was drilled to a depth of 1,052 feet, penetrating hard rock the greater part of the distance, but no flowing water was obtained. It is generally believed that the prospects for artesian water in this region are very poor.

POLK COUNTY.

Shallow wells.—The average depth of shallow wells in Polk County is 30 feet.

Artesian wells.—There is little demand for artesian water in Polk County, owing to the numerous small flowing streams and the shallow depths at which nonflowing wells may be obtained.

[a] Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geol. Survey

HARDIN COUNTY.

Shallow wells.—The shallow wells of Hardin County vary in depth from 15 to 30 feet. The county is well drained by the small flowing streams that empty into Neches River or Pine Island Bayou.

Artesian wells.—In this county there is little need for artesian water and consequently no artesian wells have been drilled. Deep wells are owned by the Santa Fe Railroad at Silsbee, Dies (Kountze post-office), and Votaw. Records of these wells and analyses of their waters are given below.

Record of well at Silsbee, Hardin County.

	Feet.
Clay and sand	0– 88
Sand	88–288
Blue sand	288–374
Yellow clay	374–392
Water sand	392–466
Clay	466–468

Analysis of water from deep well at Silsbee, Hardin County.[a]

	Parts per million.		Parts per million.
Sodium (Na)	24.0	Carbonate radicle (CO_3)	9.5
Magnesium (Mg)	5.9	Silica (SiO_2)	19.0
Calcium (Ca)	36.0	Organic matter	44.0
Chlorine (Cl)	26.0		315.4
Sulphate radicle (SO_4)	15.0		
Bicarbonate radicle (HCO_3)	136.0		

Record of deep well at Dies, Hardin County.[a]

	Feet.
Soil	0– 3
Clay	3– 18
Dry sand	18– 66
Dark clay	66– 75
Water sand	75–268

Analysis of water from deep well at Dies, Hardin County.[a]

	Parts per million.		Parts per million.
Sodium (Na)	33.0	Silica (SiO_2)	45.0
Calcium (Ca)	59.0	Sulphates of iron and aluminum	7.2
Chlorine (Cl)	62.0	Organic matter	37.0
Sulphate radicle (SO_4)	2.2		324.4
Carbonate radicle (CO_3)	79.0		

[a] Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geol. Survey.

Record of well at Votaw, Hardin County.

	Feet.
Clay	0– 18
Sand	18–168
Coarse sand	168–203
Fine sand	203–226
Coarse sand	226–260
Clay	260–265
Open water sand	265–320
Clay	320–354
Rock	354–355

Analysis of water from deep well at Votaw, Hardin County.[a]

	Parts per million.		Parts per million.
Sodium (Na)	2.7	Sulphates of iron and aluminum	10.0
Calcium (Ca)	13.0	Organic matter	39.0
Sulphate radicle (SO_4)	5.8		111.5
Carbonate radicle (CO_3)	19.0		
Silica (SiO_2)	22.0		

TYLER COUNTY.

Shallow wells.—In the southern part of Tyler County the wells are about 20 feet deep, in the eastern part about 25 feet, in the northern part about 80 feet, and in the western part about 65 feet.

Artesian wells.—No attempts to obtain artesian water have been made in this county, but an oil well was drilled near Woodville to a depth of 933 feet without finding artesian water.

JASPER COUNTY.

Shallow wells.—Shallow wells in Jasper County vary in depth from 20 to 50 feet.

Artesian wells.—So far only three artesian wells have been reported from this county, and these are all located on the ranch of Wiess & Sanders, near Wiess Bluff, in the southern part of the county. Various data concerning these wells are given below. There is a deep well at Kirbyville, a record of which follows, also an analysis of its water.

Artesian wells in Jasper County.

Owner.	Depth.	Flow per minute.	Location.
	Feet.	*Gallons.*	
Wiess & Sanders	1,062	.....	Wiess Bluff, 2¼ miles north 6° east.
Do	1,054	45	3 miles north 8° east.
Do	1,070	60	2½ miles north 7° east.

[a] Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geological Survey.

Record of Wiess & Sanders artesian well No. 1, Jasper County.[a]

	Feet.
Fine sandy loam	0– 2
Red clay	2– 25
White sand	25– 75
Yellow clay	75– 96
Fine blue sand	96– 129
Yellow clay	129– 156
White sand	156– 173
Yellow clay	173– 225
Fine blue sand	225– 252
Hard yellow clay	252– 386
White sand	386– 476
Blue clay	476– 547
Blue sand	547– 569
Hard blue clay	569– 579
Coarse white sand	579– 628
Blue clay	628– 646
Fine blue clay	646– 676
Hard blue clay	676– 695
Coarse white sand	695– 750
Hard blue clay	750– 759
Soft blue clay	759– 784
White sand	784– 794
Hard blue clay	794– 814
Fragmentary sand	814– 818
Hard blue clay	818– 900
Rotten sandstone	900– 906
Blue clay	906– 913
White sand	913– 935
Hard blue clay	935–1,002
Coarse white sand	1,002–1,021
Fine gravel	1,021–1,038
Coarse gravel	1,038–1,052
White sand	1,052–1,086
Blue clay	1,086–1,104
White sand	1,104–1,202

Record of Wiess & Sanders artesian well No. 2, Jasper County.

	Feet.
Fine sandy loam	0– 2
Yellow clay	2– 6
Yellow sand	6– 18
Gray clay	18– 27
White sand	27– 50
Yellow clay	50– 83
Fine blue sand	83– 117
Blue clay	117– 152
White sand	152– 173
Blue clay	173– 234
Fine blue sand	234– 264
Blue clay	264– 295
Fine blue sand	295– 356
Gray clay	356– 426

[a] Capacity of this well is 165 gallons a minute, or 237,000 gallons every twenty-four hours.

	Feet.
White sand	426– 520
Blue clay	520– 583
Fine blue sand	583– 620
Blue hard clay	620– 631
Coarse white sand	631– 684
Blue clay	684– 697
Fine blue sand	697– 718
Soft stone	718– 756
Hard blue clay	756– 768
Coarse white sand, loses water rapidly	768– 799
Hard blue clay	799– 853
Unable to tell the strata, drills like oil strata	853– 868
Hard blue clay	868– 936
Fine blue clay	936– 949
Hard blue clay	949– 990
White sand	990–1,012
Blue and green clay	1,012–1,039
Hard blue clay.	

Record of deep well at Kirbyville, Jasper County.

	Feet.
Yellow clay	0– 17
Yellow sand	17– 34
Coarse white sand	34– 54
Sand and gravel	54– 82
Water sand	82–212
Blue clay	212–227

Analysis of water from deep well at Kirbyville, Jasper County.[a]

	Parts per million.
Magnesium (Mg)	9.2
Chlorine (Cl)	2.5
Carbonate radicle (CO_3)	21.0
Sulphates of iron and aluminum	15.0
	47.7

NEWTON COUNTY.

Shallow wells.—The average depth of wells in Newton County is 35 feet, the deepest one being in the northern part.

Artesian wells.—The only artesian well in this county is located near Call and is owned by the Kirby Lumber Company. This well is 796 feet deep, 4 inches in diameter, and has a flow of 38 gallons a minute. Several oil wells have been drilled near this place, but no artesian flows have been obtained.

WEBB COUNTY.

Shallow wells.—The shallow wells of Webb County vary considerably in depth. In the western part they have an average depth of 60 feet; in the northern part, 425 feet; and in the eastern part, 375 feet. It is very difficult to obtain water in the southern part of the county.

[a] Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geological Survey.

Artesian wells.—At Bruniville, a station on the Texas Mexican Railway, four artesian wells were drilled for A. M. Bruni. They are each 325 feet deep and flow only about 3 gallons a minute. They are located on 1 acre of land, just south of Bruniville, within 100 feet of the railroad track.

MAVERICK COUNTY.

Shallow wells.—It is difficult to find water in Maverick County. In the northern part one well was drilled to a depth of 918 feet without getting water, while wells in other localities 500 feet deep yielded salty water.

Artesian wells.—So far as can be ascertained there are no artesian wells in Maverick County.

DIMMIT COUNTY.

Shallow wells.—In the Nueces Valley good wells are obtained at moderate depths, but on the higher lands they vary from 100 to 150 feet in depth.

Artesian wells.—There are over 60 artesian wells in Dimmit County, ranging in depth from 300 to 700 feet. The water is used for both stock and irrigation purposes. The following is a list of the artesian wells of this county, with depth, flow, and other data concerning them:

Artesian wells in Dimmit County.

Owner.	Depth.	Flow.	Diameter.	Distance and direction from Carrizo Springs.
	Feet.	*Gallons.*	*Inches.*	
F. M. Shaw	350–400	150	3⅜	2½ miles north.
Do		150	3⅜	Do.
Do		Weak.	3⅜	5 miles northwest.
Do		Weak.	3⅜	5 miles east.
J. J. Webb	500	150	4	Do.
Thos. Paterson	600	200	5⅝	4 miles east.
Do	650	200	8	Do.
A. Eardley	590–690	1,400	10	5½ miles east.
Do		1,400	10	Do.
Do		1,400	10	Do.
W. A. Mance	600	100	6¼	4 miles east.
Do	600	No flow.	6¼	Do.
J. L. Hudson	500	150	6	2 miles northeast.
M. J. Dermann (5 wells)	350	125	4	3 miles north.
Do	400	150	5 3/16	Do.
J. C. Owen	350	150	6¼	2½ miles north.
Burton	315	125	5⅝	2 miles north.
Do	375	125	5⅝	Do.
W. L. Kendall	350	150	5⅝	3 miles north.
Do	350	Weak.	5⅝	Do.
J. K. Rector	600	200	5⅝	5 miles east.
M. L. Oppenheimer	350	125	5⅜	1 mile northeast.
George & Wilkerson	600	100	5⅝	1 mile north.
F. Moehrig (3 wells)	350–600	*a* 150	5⅝	2½ miles north.
W. B. Rector	382	200	8	Do.
Couran & Jeffrey	350	100	5⅝	Do.
Craig	325	50	4½	½ mile east.
Hugh Knight	600	350	8	5 miles southeast.
Chas. Pollard	600	350	10	Do.
A. Richardson (8 wells)	600–650	100–600	4–12	6–10 miles southeast.
Ed. Schimmelphening & Bro. (2 wells)	600	150, 200	5⅝	6 miles southeast.
McCaleb & McDaniel (3 wells)	400	125–150	5⅝	5 miles southeast.
Shipp (2 wells)	325, 418	100	5⅝	4½ miles southeast.
T. A. Coleman (2 wells)	300	50, 75	5⅜	5 miles south.
G. White	350	125	5⅝	10 miles northwest.
Tom Riggs	350	125	5⅝	Do.
T. A Coleman	350	125	5⅝	Do
F. J. Arnold	500	150	8⅝	5 miles southeast.
Wm George	350	20	4½	5½ miles southeast.
Bob Lemons (2 wells)	350, 700	No flow.	6¼	6 miles southwest.

a Each.

Record of Eardley Barosa Creek well, Dimmit County (near Carrizo Springs).

	Feet.
Light red soil and clay	0– 3
Pale blue clay	3– 9
Sand and yellow clay	9– 34
Yellow clay	34– 64
Pale to dark-blue clay	64– 99
Sandstone, a little salt water, no flow	99–102
Sticky pale-blue clay	102–152
Blue clay containing small seams of coal	152–252
Sand and clay	252–297
Fine-grained sandstone	297–312
Sand and clay	312–332
Blue clay	332–377
Darker blue clay	377–417
Sand and clay	417–462
Fine sand rock. Small flow	462–522
Sandstone; flow gradually increased	522–682
Fine sand and clay	682–720

ZAVALLA COUNTY.

Shallow wells.—Water from shallow wells is obtained in the western part of Zavalla County at an average depth of 50 feet, in the southern part at a depth of 75 feet, and in the eastern and northern parts at a depth of 100 feet.

Artesian wells.—Artesian wells have been drilled in the western and southwestern parts of the county along some of the tributaries of Nueces River. The following list of wells and data concerning them were furnished by George C. Hermann, of Batesville.

Artesian wells in Zavalla County.

Owner.	Depth.	Flow.	Diameter.	Distance and direction from Batesville.
	Feet.		*Inches.*	
R. R. Ware	211	.....	5	31 miles south 56° west.
Ed. English	450	.....	5	28½ miles south 46° west.
Do	450	.....	5	28½ miles south 46° west.
Jas. Oden	400	.....	5	29 miles south 49° west.
B. H. Erskine	250	.....	5	30 miles south 50° west.
N. Y. and T. L. Co	400	.....	5	25 miles south 58° west.
Do	450	.....	5	25 miles south 66° west.
J. C. Turman	450	Slight.	5	28 miles south 71° west.
Ed. English	390	Strong.	6	28 miles south 47° west.
Do	410	Strong.	6	28 miles south 46° west.
James Oden	500	Strong.	6	28½ miles south 48° west.
B. H. Erskine	420	Strong.	6	30 miles south 50° west.
Clift	450	Strong.	6	27½ miles south 47° west.
C. Vancleve	310	Strong.	6	28 miles south 53° west.
Brown & Williams	560	Strong.	6	26 miles south 51° west.
T. A. Coleman (4 wells)	450–460	Strong.	6	31 miles south 49° west.
A. Boynton	460	Strong.	6	29 miles south 46° west.
Pratt & Hays	900	Slight.	10	25 miles south 40° west.
I. T. Pryor	1,029	(a)	10	16 miles south 70° west.
T. Riggs	420	Flows.	6	28 miles south 45° west.
A. Boynton	460	Flows.	6	29 miles south 46° west.
T. A. Colemnn	460	Strong.	6	31 miles south 49° west.
R. R. Ware	260	Strong.	6	32 miles south 56° west.

[a] Water rises within 10 feet of surface.

LASALLE COUNTY.

Shallow wells.—In Lasalle County the pump wells are considerably deeper than those in adjoining localities. They vary from 150 to 200 feet in depth.

Artesian wells.—There are 27 artesian wells in this county. The area of greatest development in well boring is around Artesia, where a number of wells are utilized for irrigation purposes. They vary in depth from 200 to 500 feet and usually furnish a strong flow of good water. At Cotulla the International and Great Northern Railroad has drilled a well 1,008 feet deep, but the water is slightly impregnated with salts of magnesia. In the vicinity of Dull's ranch, in the northeastern portion of the county, along Frio River, there is a well-developed artesian district. The following is a list of the artesian wells of the county:

Artesian wells in Lasalle County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	Feet.	*Gallons.*	*Meters.*	
International and Great Northern R. R.	900	6	.....	Cotulla.
Do	1,008	.....	.....	Do.
J. W. McInnis	486	15	.....	Do.
Joe Cotulla	400	4	.....	Cotulla, 1½ miles north.
A. Armstrong	764	2	.....	Cotulla, 8 miles west.
J. M. Ramsey	550	24	6	Artesia, 2 miles northeast.
Do	550	24	6	Do.
Do	350	15	6	Do.
Do	350	8	6	Artesia, 1 mile northeast.
Do	186	5	6	Artesia, ½ mile northeast.
J. W. Bucow	400	20	6	Artesia, 4 miles east.
W. H. McWhorter	450	10	6	Artesia, 1 mile south.
Kuhn	600	10	6	Artesia, 6 miles east.
Anderson & Sinclair	670	10	8	Artesia, 1 mile northwest.
Do	670	10	8	Artesia, ½ mile northeast.
Crossley	400	10	6	Artesia, 1 mile southeast.
C. H. DeRyle	450	10	6	Artesia, 1½ mile southeast.
T. J. Alderman	180	0	.....	Artesia, 3 miles northeast.
Do	650	0	.....	Do.
Naylor & Jones	295	4	6	Dull's ranch, 2 miles east.
Do	366	4	6	Dull's ranch, 7 miles east.
Do	720	30	6	Dull's ranch, 14 miles northeast.
Do	310	12	6	Dull's ranch, 3 miles east.
Do	300	4	6	Dull's ranch, 7 miles northeast.
W. C. Irwin	797	100	.....	Dull's ranch, 7 miles northwest.
Uhl & Gaith	767	4	1	Cotulla, northwest.
International and Great Northern R. R.	800	0	.....	Encinal.

McMULLEN COUNTY.

Shallow wells.—The nonflowing wells of McMullen County are generally deep. In the eastern part they have an average depth of 130 feet, in the northern part 250 feet, and in the southern part 350 feet. No information has been received concerning the depth of wells in the western part of the county.

Artesian wells.—Data have been obtained of seven artesian wells in McMullen County. A list of these wells, with their depth, flow, size, and approximate location is given below:

Artesian wells in McMullen County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	Feet.	*Gallons.*	*Inches.*	
County	485	.....	4	Public square, Tilden.
Ortho Askey	300	.....	.....	Tilden, 12 miles east.
Do	147	5	.....	Tilden, 13 miles east.
Sam Crowther	1,728	250	.....	Tilden, 14 miles northeast.
Do	1,325	200	.....	Do.
Naylor & Jones	700	15	6	Tilden, 20 miles west.
Do	512	15	6	Do.

FRIO COUNTY.

Shallow wells.—Water is obtained from shallow wells in Frio County at depths of 60 to 125 feet.

Artesian wells.—There are flowing wells along San Miguel Creek, also at Derby, and northwest of Derby along Frio River. A typical artesian well of Frio County is shown on Pl. I, *B* (p. 1). Many of the wells along San Miguel Creek are located along the creek bed, on very low ground; most of them are about 400 feet in depth, 8 inches in diameter, and flow about 10 gallons a minute. The general distribution of these wells is shown in Pl. II (p. 2), and their depth, size, flow, and approximate location are given in the following table:

Artesian wells in Frio County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	Feet.	*Gallons.*	*Inches.*	
G. F. Hinds	420	25	.....	San Miguel Creek, 1½ miles from Atascosa County line.
Do	410	15	.....	Do.
Do	400	20	.....	Atascosa County, 4 miles north of No. 2.
F. M. O'Connor	405	50	5	San Miguel Creek, 1 mile above No. 1.
Do	200	17	4	San Miguel Creek, 1 mile above No. 4.
Do	115	12	2	San Miguel Creek, 2 miles above No. 5.
Do	60	7	1	San Miguel Creek, 2 miles above No. 6.
Do	300	20	4	1 mile south of No. 4.
S. Speed	.....	.....	.....	Derby, 4 miles east.
Do	.....	.....	.....	Do.
P. E. Authar	600	.....	6	Pearsall, 4 miles north.
Halff & Schremer	800	.....	5	Pearsall, 6 miles southwest.
Do	1,473	400	5	Pearsall, 4 miles south.
Keystone Land and Cattle Co	.....	10	8	San Miguel Creek, 4 miles above No. 7.
Do	.....	10	8	San Miguel Creek, 3 miles above No. 14.
Do	398	10	8	San Miguel Creek, 3 miles above No. 15.
Do	.....	10	8	San Miguel Creek, 4 miles above No. 16.
Do	.....	2	8	San Miguel Creek, 1 mile west of No. 17.
Do	.....	10	8	San Miguel Creek, 4 miles above No. 17.
.....	.....	5	8	San Miguel Creek, 1 mile below No. 6.
.....	380	12	6	Miguel, 5 miles west of post-office.
.....	648	.....	8	2 miles south of No. 18.
J. W. De Villbis	125	19	2	San Miguel Creek, ½ mile above No. 6.

ATASCOSA COUNTY.

Shallow wells.—A good supply of excellent water is obtained from wells 40 to 60 feet deep throughout the greater part of Atascosa County.

Artesian wells.—Artesian water is found in all parts of this county, at depths varying from 200 to 700 feet. The county is well drained by the tributaries of San Miguel Creek, and wells for the most part are located along these tributaries. The approximate location of artesian wells, also their depth, flow, and diameter are given in the following table:

Artesian wells in Atascoса County.

Owner.	Depth.	Flow per minute.	Diameter.	Distance and direction from Pleasanton.
	Feet.	*Gallons.*	*Inches.*	
J. B. Williams	120	20	.....	1 mile east.
Do	520	10	.....	Do.
Theo. Oden	447	30	.....	8 miles south.
Do	376	7	.....	Do.
Do	620	32	.....	Do.
J. W. Murphy	625	.....	.....	11 miles southwest.
International and Great Northern R. R	740	20	.....	20 miles southwest.
Beever & Hindes	400	5	.....	19 miles southwest.
Bar Fuller	314	60	.....	4 miles northeast.
James Draper	230	4	.....	4 miles north.
Dr. E. L. Sharpe	500	40	.....	In town.
Do	340	15	.....	Do.
John Dossey	320	6	.....	7 miles southeast.
James Gilliland	510	.....	.....	6 miles northeast.
Coughran Bros	397	.....	.....	5 miles east.
Mrs. E. Johnson	337	30	.....	Do.
Do	227	50	.....	3 miles east.
Henry Martin	430	10	.....	4 miles southeast.
Geo. M. Martin	319	15	.....	3 miles northwest.
J. M. Solis	300	2	.....	6 miles northwest.
José Estrada	240	12	.....	5 miles northwest.
Anton Ploch	228	4	.....	4 miles northeast.
Do	208	8	.....	Do.
Coughran Bros	308	55	4	6 miles northeast.
Do	540	60	3½	5 miles east.
J. J. Stevens	915	.....	.....	8 miles northeast.
Do	700	.....	.....	12 miles northeast.
Do	1,011	.....	.....	11 miles east.
Manuel Leal	207	.....	.....	8 miles southeast.
C. T. Tom	441	35	2	19 miles southeast.
Alice Peeler	139	4	.....	16 miles southeast.
Do	165	6	.....	Do.
J. N. McAda	340	4.5	.....	12 miles southeast.
Do	202	4.5	.....	13 miles southeast.
D. C. McAda	200	4.5	.....	12 miles southeast.
A. Oppenheimer	729	40	.....	6 miles south.
Do	700	35	.....	4 miles south.
Do	525	75	.....	14 miles south.
John Campbell	280	12	.....	18 miles southeast.
Court-house	378	.....	.....	In town.
Mrs. N. R. Wallace	377	30	.....	Do.
Allen & Wilson	357	18	.....	Do.
L. A. Franks	368	.....	.....	Do.
F. M. Mansfield	406	4	.....	Do.
V. Richter	301	5	.....	2½ miles northeast.
J. A. Walton	497	40	2	In town.
J. S. Thornton	700	100	4	Do.

BEXAR COUNTY.

Shallow wells.—In the southern part of Bexar County water can be procured at depths varying from 30 to 60 feet; near Vanraub, at a depth of 325 feet, and at Leon Springs, at depths of 40 to 200 feet.

Artesian wells.—There are nearly 100 artesian wells in Bexar County. Some of them are among the strongest wells in the State. The water

is of excellent quality and is used largely for irrigation. The following is a list of the artesian wells, giving location and other data:

Artesian wells in Bexar County.

Owner.	Depth.	Flow per minute.	Location with respect to San Antonio.
	Feet.	*Gallons.*	
West End Town Co.	260	150	West End Lake.
Russ	250	60	In town.
Brendle	583	.....	3 miles north.
Yantis	540	400	2.5 miles northwest.
Waterworks No. 1	630	1,042	½ mile below head of river.
Waterworks No. 2-4	780	[a] 1,042	1½ miles below head of river.
Waterworks Nos. 5-8 [b]	880	[a] 4,166	Market street.
Waterworks Nos. 9-12 [c]	880	[a] 1,740	Do.
Schulz Sanitarium	712	555	Alamo Plaza.
Crystal Ice Co.	657	417	Eighth street.
Do.	657	417	Do.
Do.	715	278	Do.
Do.	850	36	Do.
Street railway	980	156	Tenth street.
Do.	1,140	17	Do.
Court-house [d]	760	861	Center of city.
State asylum [e]	1,900	Flows.	3 miles southeast.
Col. Terrell [e]	1,900	555	5 miles southeast.
C. Kampman	650	200	3 miles east.
Do.	464	20	Do.
Geo. Dulnig [f]	2,215	1,007	6 miles southeast.
Santa Rosa Hospital	1,000	104	400 yards northwest court-house.
Do.	1,250	.....	Do.
Schulz	822	200	2½ miles northwest.
Union Meat Co.	1,202	300	1½ miles southwest.
Menger Hotel	1,160	170	
Koelbeen	1,100	140	Southern Pacific round-house.
Dignowitty	465	55	1½ miles west.
Kampman	850	200	Velita street.
Epps	884	70	2¼ miles southwest.
Van Dale	835	55	2 miles west.
F. F. Collins	700	1,200	½ mile southwest.
Do.	850	300	¼ mile northeast.
T. F. Brady	1,500	400	2½ miles southwest.
Walters	900	200	Do.
Barnes	950	1,200	Do.
Meerscheidt-Stieren Irrigation Co. [g]	950	800	3 miles west.
A. Herff	1,200	Slight.	3½ miles west.
Elmendorf	750	377	3 miles west.
Hofheinz	.....	.....	5 miles southwest.
Tommins	1,500	Slight.	2½ miles south.
Acme Irrigation Co.	1,200	No flow.	5 miles southwest.
J. D. Guinn	610	50	3 miles northeast.
H. J. Ackerman	1,400	50	6 miles east.
Watters	1,400	50	2½ miles southwest.
D. Sullivan	800	No flow.	3 miles northwest.
J. C. Chaney	1,500	100	2½ miles southeast.
City brewery	728	2,083	James street.
Do.	728	2,083	Do.
Lone Star Brewery	805	650	Jones street.
United States Ice Plant	710	650	Grayson street.
Do.	710	650	Do.
D. Meyer	.....	.....	3 miles west.
Tappans polo ranch	.....	.....	5 miles northwest.
J. D. Guinn	1,000	No flow.	5½ miles northeast.
T. B. Dashiel	635	Slight.	7 miles northeast.
W. Eisenhauer	700	....do...	5 miles east.
Urbahn	1,200	No flow.	4 miles east.
Kampman [h]	1,000	Occasional.	3 miles north.
St. Louis College	720	No flow.	5 miles west.
Do.	720	....do...	Do.
International and Great Northern R. R. [i]	808	Good.	At Davenport.

[a] Each.
[b] Four 12-inch wells.
[c] Four 8-inch wells.
[d] Gas and water at 460 and 620 feet below surface.
[e] Hot sulphur water.
[f] 6-inch well yielding hot sulphur water.
[g] Two wells: One 6-inch, with 800-gallon flow; one 10-inch, with 3,000-gallon flow.
[h] Water at 630 feet.
[i] Water rises within 110 feet of surface.

WILSON COUNTY.

Shallow wells.—The shallow wells of Wilson County are from 30 to 150 feet deep.

Artesian wells.—There are two principal artesian-well districts in the county—one in the southwestern part, where a group of wells is owned by J. S. Thornton and J. J. Stevens, and one in the vicinity of Stockdale and Sutherland Springs. A list of these wells, including available data, is given below.

Artesian wells in Wilson County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	Feet.	*Gallons.*	*Inches.*	
W. W. Beaty	565	20	.....	Union, ½ mile northeast.
J. S. Thornton	700	15	2½	Floresville, 8 miles southwest.
Do	840	90	4	Floresville, 11 miles south, 4 west.
Do	460	30	3	Floresville, 8 miles south, 7 west.
J. J. Stevens	365	40	.....	Floresville, 10 miles west, on Borego Creek.
Do	650	50	.....	Floresville, 11 miles southwest, on Borego Creek.
Do	650	50	.....	Floresville, 10½ miles northwest, on Borego Creek.
Do	1,036	50	.....	Floresville, 13 miles southwest, on Prietas Creek.
Do	960	50	.....	Floresville, 16 miles southwest, on Lucas Creek.
W. A. Coughran	700	15	3½	Floresville, 4 miles west.
T. B. Coughran	480	12	2½	Floresville, 5 miles west.
H. M. Aubrey	1,200	.....	.....	Sutherland Springs, ½ mile northeast.
Hobbs	400	00	.....	Sutherland Springs, 3 miles southeast.

GUADALUPE COUNTY.

Shallow wells.—Water is obtained in Guadalupe County in the eastern part at an average depth of 40 feet, in the southern part at 60 feet, in the western part at 70 feet, and in the northern part at 80 feet.

Artesian wells.—The only attempt to develop the artesian-water resources of this county was made by Adolph Ziegenhols, on his farm 12 miles north of Seguin, where a flow of strong sulphur water was found at a depth of 800 feet.

CALDWELL COUNTY.

Shallow wells.—Good wells are obtained throughout the greater part of Caldwell County at depths varying from 18 to 50 feet. Near Lockhart wells are from 18 to 20 feet deep, but on the prairie west of Lockhart they are somewhat deeper. South of Maxwell and east of Martindale it is difficult to get water, and it is generally not obtained at depths less than 100 feet.

Artesian wells.—Only two artesian wells have been reported from this county. T. F. Hudson, near Lockhart, has a 6-inch flowing well 260 feet deep, and V. Leshikar has one 5 miles west of Lockhart which has a depth of 180 feet, a diameter of 8 inches, and a flow of only a few gallons a minute.

BASTROP COUNTY.

Shallow wells.—Throughout Bastrop County the shallow wells are from 35 to 70 feet deep and generally furnish a good supply of water.

Artesian wells.—Very little prospecting has been done for artesian water in this county. In 1893 a well was drilled to a depth of 1,010 feet near Bastrop by the Bastrop Building and Loan Association without striking water.

LEE COUNTY.

Shallow wells.—In Lee County the average shallow well is 40 to 50 feet deep, and a good supply is usually obtained.

Artesian wells.—Owing to the ease with which shallow wells may be obtained in this county, few attempts have been made to develop artesian water. The only flowing well in the county is owned by M. G. York, near Leobau. It is a 6-inch well, 800 feet deep, but the exact flow has not been ascertained.

ROBERTSON COUNTY.

Shallow wells.—A good supply of water is found in Robertson County about 40 feet below the surface.

Artesian wells.—There are a large number of flowing wells between Big and Little Brazos rivers, from a point opposite Calvert to the mouth of the Little Brazos, a distance of about 25 miles. Water is obtained throughout this valley at four artesian horizons at depths of 160, 450, 650, and 920 feet. Attempts to get water east of Hearne, on the highland extending from Bremond to Franklin, have resulted in failure. At Hearne there are 23 flowing wells, nearly all of which obtain water from an artesian horizon 700 feet below the surface. The following is a list:

Artesian wells at Hearne.

Owner.	Depth.	Owner.	Depth.
	Feet.		*Feet.*
W. Creanan	740	L. W. Carr	700
Do	680	C. J. Hostrasses	690
Houston and Texas Central R. R	720	R. C. Allen	666
Do	720	Mrs. H. K. Davis	710
Compress	700+	Chas. Wood	400
Gin and Light Co	700+	W. P. Ferguson	720
Do	700	J. H. Hartzog	720
National Oil Co	715	C. L. Glass[b]	690
Planters' O l Co	660	Do	700
Stock Yards[a]	1,020	Do	710
Do	750	City	720
W. Kerlicks	700		

[a] One mile northwest of Hearne.

[b] Three miles southwest of Hearne.

MILAM COUNTY.

Shallow wells.—The average depth of shallow wells throughout Milam County is 50 feet. An abundant supply is usually obtained. In the western part of the county considerable difficulty is sometimes experienced in getting a successful well.

Artesian wells.—The International and Great Northern Railroad drilled a 6-inch well at Thorndale to a depth of 2,000 feet, passing through several beds of lignite coal, without obtaining artesian water. Other similar deep borings have been made for artesian water in the western part of the county without success. The following is a list of deep borings in Milam County:

Deep borings in Milam County.

Owner.	Depth.	Location.
	Feet.	
W. S. Caruthers	1,790	Thorndale.
A. E. Brady	1,356	Maysfield.
T. J. Estes	831	Baileyville, 3½ miles west.
A. J. Raymond	700	Branchville.
J. A. Peele	530	Branchville, 4 miles east.

BURLESON COUNTY.

Shallow wells.—In Burleson County wells 50 to 75 feet deep furnish a good supply of water.

Artesian wells.—Flowing wells are obtained in the Brazos bottom lands at depths varying from 355 to 1,250 feet, the average being about 700 feet. A list of these wells, with other data, the record of a 688-foot well at Clay, and analyses of the water from this well and from one of M. Parker's wells are given below:

Artesian wells in Burleson County.

Owner.	Depth.	Flow per minute.	Diameter.	Location.
	Feet.	*Gallons.*	*Inches.*	
J. W. Coulter	750	10	1¼	Clay, 6 miles northeast.
Do		Small.	1	Clay, 7½ miles northeast.
Carson & Smith	355	5	1	Clay, 8 miles northeast.
Do	750	Strong.	1	Do.
T. R. Batte[a]	850	50	1¼	Whittaker, 3½ miles southeast.
J. O. Chance	900	1½	2	Whittaker, 1½ miles northeast.
Do.[b]	1,009	3	1½	Whittaker.
Do.[c]	650	7	3	Whittaker, 3½ miles northwest.
Do	700	½	1	Whittaker, 4½ miles northwest.
Do	550	½	2	Whittaker.
Fountain Bros	1,250	20	2	Whittaker, 1½ miles northwest.
Do	900	½	1	Do.
Do	900	½	1¼	Do.
Do	900	1	1¼	Myers, 1 mile southeast.
A. L. Ewing	740	2	2	Myers, 1 mile south.
J. B. Rosprim	910	5	2	Myers.
G. G. Foster	900	20	2	Myers, 400 yards west.
Do	900	25	1¼	Myers, 800 yards west.
Adline Jones	850	20	2	Myers, 2 miles southwest.
Jas. Butler	840	25	2	Myers, 3 miles northwest.
Do	900	25	2	Myers, 3 miles north.
Do	850	20	2	Grant, ½ mile south.
Mit. Parker	630	12	1	Cooks Point, 3 miles east.
Do	585	12	1	Do.
Do	535	15	1	Pittbridge.
Do	630	15	1	Pittbridge, 1 mile west.
Do	835	35	1	Pittbridge, 4 miles south.
Do.[d]	750	30	2	Tunis, 1¼ miles east.
Do	760	15	2	Tunis, 3 miles southeast.
T. M. Ewing[e]	511	2	2	Pittbridge, 1¼ miles east.
Robt. Dennis	400	7	1	Pittbridge, 1½ miles northeast.
R. A. Rogers	420	2½	1	Stone City, 300 yards south.
Frank Aldridge[f]	760	2	1	Rita, 7½ miles south.
Joe Collier	800	5	1	Rita, 2 miles east.
T. F. Hudson	260	160	6	Caldwell, ½ mile northeast.
V. Leshikar	180	Small.	8	Caldwell, 5 miles southwest.
J. D. Rogers[g]	703	45	3	Somerville, 7 miles southeast.

[a] Temperature of water 77° F.; gas escapes from pipe.
[b] Continuous flow of gas; water salty.
[c] Gas associated with water.
[d] At 350 feet a flow of salt water associated with gas was obtained.
[e] Well flowed 60 gallons a minute at first, but is now becoming choked with sand.
[f] Oil well.
[g] Good flow obtained at 400 feet.

Analysis of water from deep well owned by Mit. Parker, 3 miles southeast of Tunis, Burleson County.[a]

	Parts per million.		Parts per million.
Potassium (K)	7	Sulphate radicle (SO_4)	630
Sodium (Na)	520	Carbonate radicle (CO_3)	520
Magnesium (Mg)	4		
Calcium (Ca)	11		1,756
Chlorine (Cl)	64		

[a] Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geol. Survey.

Record of well at Clay, Burleson County.

	Feet.
Soil	0– 15
Clay	15– 28
Rock	28– 41
Sand	41– 67
Lignite	67– 74
Blue granite	74– 88
Blue sand	88–124
Gray sand rock	124–161
Lignite	161–169
Blue limestone rock	169–185
Sand	185–188
Gray sand rock	188–197
Soapstone	197–217
Rock	217–220
Soapstone	220–249
Fine blue sand	249–254
Blue limestone	254–261
Soapstone	261–271
Rock	271–282
Soapstone	282–420
Fine water sand	420–480
Soapstone	480–525
Close blue sand with lignite and soapstone	525–608
Water sand	608–613
Lignite and soapstone	613–632
Water sand	632–636
Soapstone and sand	636–647
Water sand	647–687
Rock	687–688

Analysis of water from deep well at Clay, Burleson County. [a]

	Parts per million.		Parts per million.
Sodium (Na)	490.0	Carbonate radicle (CO_3)	30.0
Magnesium (Mg)	8.0	Silica (SiO_2)	38.0
Calcium (Ca)	21.0	Organic matter	79.0
Chlorine (Cl)	490.0		
Sulphate radicle (SO_4)	4.6		1,480.6
Bicarbonate radicle (HCO_3)	320.0		

BRAZOS COUNTY.

Shallow wells.—Water in sufficient quantity to supply an ordinary well is found in Brazos County from 35 to 60 feet below the surface.

Artesian wells.—The best developed artesian area in Brazos County is located near Steeles Store and Stone City, between Little and Big Brazos rivers, where about 50 flowing wells are located. About 15 miles southwest of Bryan there are a number of smaller artesian wells, varying in depth from 200 to 1,000 feet, but averaging about 300 feet, with diameters of 1 to 3 inches. The smaller wells yield about

[a] Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geol. Survey.

47 gallons a minute; the larger and deeper ones furnish considerably more. In sinking the deep wells in this district several small flows are encountered before the main water horizon is reached. These are generally cased off and only the water from the lowest horizon allowed to flow. In addition to the above-described wells there are a few in the southern part of the county. A partial list of the artesian and deep wells of Brazos County is given below, also a record of the materials penetrated in the Hearne and Brazos Valley Railroad well at Stone City.

Partial list of artesian and deep wells in Brazos County.

Owner.	Depth.	Flow.	Location.
	Feet.		
Hearne and Brazos Valley R. R	1,005	.....	Stone City.
Templeton & Foster	.....	Flows...	Navasota, 6 miles west.
John D. Rogers	900	Flows...	Allenfarm.
Do	1,300	Flows...	Allenfarm, 1 mile west.

Record of Hearne and Brazos Valley Railroad well at Stone City, Brazos County.

	Feet.	
Surface blue clay	0–	25
Rock	25–	28
Blue clay	28–	60
Rock	60–	61
Blue marl	61–	105
Lignite	105–	106
Blue marl	106–	145
Rock	145–	147
Blue marl with an occasional layer of rock	147–	1,005

MADISON COUNTY.

Shallow wells.—Throughout Madison County good water is obtained from wells at depths of 50 to 80 feet, depending on the elevation of the surface.

Artesian wells.—Owing to the ease with which good shallow wells are obtained and the numerous small flowing streams traversing the county, there is little need for flowing wells, and so far as can be ascertained no attempts have been made to develop this resource.

LEON COUNTY.

Shallow wells.—In Leon County shallow wells vary in depth from 30 to 45 feet, and a good supply of water is generally struck.

Artesian wells.—The only artesian well in Leon County is that owned by J. H. Oliver. It is located one-half mile northwest of Buffalo and has a depth of 1,200 feet.

FREESTONE COUNTY.

Shallow wells.—The shallow wells of Freestone County are from 35 to 45 feet deep and generally contain from 6 to 20 feet of water.

Artesian wells.—Owing mainly to the abundant supply of shallow-well water throughout the county, no attempts have been made to get artesian flows.

HOUSTON COUNTY.

Shallow wells.—Most of the shallow wells throughout Houston County are less than 40 feet deep, and a large supply of water is generally obtained.

Artesian wells.—At Crockett a well was sunk by Prof. J. B. Smith to a depth of 700 feet, and the water rose within 40 feet of the surface. There are several wells at Kenard 1,100 to 1,200 feet deep, from which a large supply of water is obtained by pumping.

ANDERSON COUNTY.

Shallow wells.—A good water supply is found in Anderson County at a depth of 30 to 40 feet below the surface.

Artesian wells.—There are no artesian wells in this county, but several deep borings have been made at Palestine and other places which furnish a good supply of water by pumping.

LIMESTONE COUNTY.

Shallow wells.—Water is secured in the southern part of Limestone County at a depth of about 35 feet. In the northwestern part the wells are somewhat deeper, averaging 60 feet.

Artesian wells.—There are no artesian wells in Limestone County, although it is believed that flows might be obtained if wells were sunk to a sufficient depth.

CHEROKEE, TRINITY, ANGELINA, SAN AUGUSTINE, AND SABINE COUNTIES.

Shallow wells.—Throughout Cherokee, Trinity, Angelina, San Augustine, and Sabine counties shallow wells find water at depths varying from 30 to 50 feet, and the supply is generally large.

Artesian wells.—The only artesian well in these counties is at Groveton, the county seat of Trinity County, where a 6-inch well 495 feet deep yields 27 gallons a minute. There is a deep well at Bronson, Sabine County, a record of which is given below, also an analysis of the water.

Record of deep well at Bronson, Sabine County.

	Feet.
Yellow clay	0– 30
Blue clay	30– 60
Brown shale	60– 103
Sand	103– 115
Brown shale	115– 145
Sand	145– 155
Blue clay	155– 163
Limestone rock	163– 164
Blue clay	164– 258
Sand	258– 272
Blue clay	272– 322
Brown shale	322– 352
Blue clay	352– 374
Blue clay and "shell"	374– 380
Blue clay	380– 486
Sand rock	486– 489
Blue clay	489– 578
Blue clay and bowlders	578– 586
Blue clay	586– 674
Water sand	674– 729
Blue clay	729– 810
Dark sand	810– 818
Blue clay	818– 892
Blue shale and "shell"	892– 928
Dark shale	928–1,018
Water sand	1,018–1,068
Dark clay	1,068–1,070

Analysis of water from deep well at Bronson, Sabine County. [a]

	Parts per million.		Parts per million.
Sodium (Na)	330.0	Silica (SiO_2)	17.0
Chlorine (Cl)	30.0	Organic matter	34.0
Sulphate radicle (SO_4)	8.1		814.1
Carbonate radicle (CO_3)	395		

NACOGDOCHES COUNTY.

Shallow wells.—Wells of moderate yield are obtained in Nacogdoches County at a depth of 25 feet.

Artesian wells.—Two wells have been sunk in this county and data concerning them are given below.

Artesian wells in Nacogdoches County.

Owner.	Depth.	Flow per minute.	Diameter.	Distance from Nacogdoches.
	Feet.	*Gallons.*	*Inches.*	
Nacogdoches Ice Co	285	.....	4	½ mile southwest.
Haywood Lumber Co	820	40	6	1 mile southeast.

[a] Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geol. Survey.

SHELBY, PANOLA, AND RUSK COUNTIES.

Shallow wells.—Water in Shelby, Panola, and Rusk counties is obtained in abundance in wells ranging from 20 to 35 feet in depth.

Artesian wells.—There is little demand for artesian water in these counties, owing mainly to the shallow depth at which ground water may be obtained. At Center, Shelby County, there is a deep well, a record of which is given below; also an analysis of the water.

Record log of deep well at Center, Shelby County.

	Feet.
Yellow clay	0– 10
Brown shale	10–106
Lignite	106–108
Brown shale	108–240
Sand	240–250
Brown shale	250–320
White sandstone	320–330
Brown shale	330–356
Lignite	356–358
Brown shale	358–372
White sandstone	372–374
Brown shale	374–416
"Stone coal"	416–417
Brown shale	417–443
Sandstone	443–445
Brown shale	445–517
"Gray granite"	517–520
Brown shale	520–556
Sandstone	556–557
Brown shale	557–562
"Gray granite"	562–564
White sand, water bearing	564–614
Brown shale	614–623

Analysis of water from deep well at Center, Shelby County.[a]

	Parts per million.		Parts per million.
Sodium (Na)	370.0	Silica (SiO_2)	24.0
Calcium (Ca)	4.1	Organic matter	31.0
Chlorine (Cl)	57.0		930.1
Sulphate radicle (SO_4)	14.0		
Carbonate radicle (CO_3)	430.0		

VAN ZANDT AND RAINS COUNTIES.

Shallow wells.—Throughout Van Zandt and Rains counties an adequate supply of water is obtained from wells ranging in depth from 20 to 45 feet.

Artesian wells.—There are at present no flowing wells in either of these counties; and, so far as can be ascertained, no prospecting for artesian water has been done.

[a] Expressed by analyst in grains per gallon and hypothetical combinations; recomputed to parts per million and ionic form at U. S. Geol. Survey.

SMITH COUNTY.

Shallow wells.—In Smith County water occurs at shallow depths, rarely exceeding 35 feet, and the supply is usually large.

Artesian wells.—A few years ago an oil well was drilled on the county poor farm to a depth of 460 feet and a strong flow of water obtained. No other deep borings have been reported from this county, but it is believed that artesian water could be obtained at other localities if wells were sunk to a sufficient depth.

WOOD AND GREGG COUNTIES.

Shallow wells.—Water is found in Wood and Gregg counties at depths ranging from 25 to 80 feet. The supply is large and the quality generally good, but a few wells near Quitman and Winnsboro furnish water containing a large percentage of mineral salts.

Artesian wells.—No flowing wells have been reported from either of these counties. About 6 miles south of Longview, Gregg County, an oil well was sunk to a depth of 1,424 feet without obtaining artesian water. It is possible that flows might be found at shallower depths in Wood County or in other parts of Gregg County, but thus far no tests have been made in these localities. A record of the deep oil well near Longview is given below:

Partial record of well 6 miles south of Longview, Gregg County.

	Feet.
No record	0– 285
Soapstone	285– 305
Flint	305– 307
Soapstone	307– 322
Shaly clay	322– 329
Sandy shale	329– 353
Clay	353– 356
Sandy shale	356– 437
Clay	437– 452
Sandy shale	452– 487
Flint	487– 489
Sandstone	489– 543
Lignite	543– 545
Clay	545– 551
Sand	551– 571
Flint	571– 574
Sandy shale	574– 710
Clay	710– 745
Sandstone	745– 756
Water-bearing sand	756– 780
Sandstone	780– 880
Clay	880– 892
Sandy shale	892–1,027
Clay	1,027–1,034
Sandy shale	1,034–1,199
Flint	1,199–1,200
Sandstone	1,200–1,246
Sandy shale	1,246–1,424
Gumbo.	

UPSHUR COUNTY.

Shallow wells.—In Upshur County the water table appears to be about 35 to 40 feet below the surface, and at this depth a good supply of relatively pure water is obtained.

Artesian wells.—The only artesian well which has been reported from this county is on the John Gillis ranch, 1½ miles southwest of Hawkins. It is 250 feet deep and yields a flow of 2½ gallons a minute.

HARRISON COUNTY.

Shallow wells.—In Harrison County sufficient water for ordinary domestic purposes is struck at depths rarely exceeding 40 feet, and the quality is usually good.

Artesian wells.—The only artesian well in Harrison County is owned by the Marshall waterworks. This well was bored in January, 1900, and the first flows were obtained at shallow depths. It is 208 feet deep, 6 inches in diameter, and has a flow of 200,000 gallons every twenty-four hours. The following is a record of the material penetrated:

Record of artesian well at Marshall, Harrison County.

	Feet.
Soil and clay	0– 80
Sand with rock at base, water bearing	80–100
Clay with layers of lignite	100–160
Sand with rock at base, water bearing	160–180
Sand, water bearing	180–208

This test well was made without a strainer, and considerable sand was brought up with the water. The test was continued for about twelve hours with no apparent change of flow.

MARION COUNTY.

Shallow wells.—Water in Marion County is found at 25 to 50 feet below the surface, and the supply is both abundant and pure.

Artesian wells.—The only artesian well reported from this county is owned by J. M. De Ware, at Jefferson. It is 2 inches in diameter, 801 feet deep, and yields a small flow, but the exact amount has not been ascertained.

INDEX.

A.

Page.

Acknowledgments to those aiding 1
Alameda, wells near 25
Alice, well near, record of 12
Alligator Head, well at, record of 15
Alta Loma, wells at 28
wells at, record of 28–29
Alvin, wells near 21
Anahuac, wells at and near 31
Anaqua, wells near 14
Anderson County, artesian wells in 63
shallow wells in 63
Angelina County, artesian wells in 63
shallow wells in 63
Arcola, well near 24
Area of region 1
Aransas County, artesian wells in 14
shallow wells in 14
Arnold well, record of 22–23
Artesia, wells near 53
Artesian wells, flow of 3
location of, map showing 2
occurrence of 2–3
views of 1, 6
Atacosa County, artesian wells in 54, 55
shallow wells in 55
Atravesada well, record of 5–6
Ashby, well near 19
Austin County, artesian wells in 41
shallow wells in 41

B.

Barker, well near 25
Barosa Creek, well on, record of 52
Bastrop, well near 58
Bastrop County, artesian wells in 58
shallow wells in 58
Batesville, wells near 52
Bay City, wells near 19
Bay View, well near 29
Beasley (S. H.) well, record of 17–18
Beaumont, well at 31
Bee County, artesian wells in 34
shallow wells in 34
Bexar County, artesian wells in 55–56
shallow wells in 55
Blessing, wells near 19
Bobbin, well at, record of 44–45
well at, water of, analysis of 45
Branchville, wells at and near 59
Brazoria, well near 21
Brazoria County, artesian wells in 21–24
artesian wells in, records of 22–24
shallow wells in 21

Page.

Brazos, wells near 21
Brazos County, artesian wells in 61–62
artesian wells in, record of 62
shallow wells in 61
Brenham, water supply of 41
Breslau, well at 38
Bronson, well at, record of 63–64
well at, water of, analysis of 64
Brown (H. G.) well, record of 35
Brownsville, wells at 3
Bruniville, wells at 51
Bryan, wells near 61
Bryan Heights, well near 21
Buffalo, well near 62
Burleson County, artesian wells in 60–61
artesian well in, record of 61
water of, analyses of 60, 61
shallow wells in 60

C.

Caldwell, wells near 60
Caldwell County, artesian wells in 58
shallow wells in 57
Calhoun County, artesian wells in 14–15
artesian wells in, record of 15
shallow wells in 14
Call, well near 50
Calvert, wells near 58
Cameron County, artesian wells in 3–6
artesian wells in, records of 5–6
shallow wells in 3
Carancohue, wells near 16
Carrizo Springs, wells near 51–52
Cedar Bayou, wells at 31
Center, well at, record of 65
well at, water of, analysis of 65
Chambers County, artesian wells in 30–31
shallow wells in 30
Chapel Hill, wells near 41
Cherokee County, artesian wells in 63
shallow wells in 63
Chesterville, artesian wells near 3
irrigation near 3
Clay, wells at 60
wells at, record of 61
water of, analysis of 61
Cleveland, well at, record of 44
well at, water of, analysis of 44
Clodine, wells at 24
Colorado County, artesian wells in 40
artesian wells in, record of 40
shallow wells in 39
Columbia, wells near 21
Columbus, well at, record of 40

	Page.
Conroe, well at, record of	45–46
well at, water of, analysis of	46
Cooks Point, wells near	60
Corpus Christi, elevation at	2
Cotulla, wells near	53
Counties, underground water in, description of	3–67
Courtney, wells near	42
Cretaceous rocks, occurrence of	2
Crockett, well at	63
Cuero, well near, record of	35
Cunningham farm, wells on	24

D.

Damon mound, well at	21
Davenport, well at	56
Deepwater, wells at	24, 25
Deerpark, wells at	25
Derby, wells at and near	54
Dewet, wells at and near	36
Dewitt County, artesian wells in	35
artesian wells in, record of	35
shallow wells in	34
Dickinson, wells at and near	29
Dies, well at	47
well at, record of	47
water of, analysis of	47
Dimmit County, artesian wells in	51
artesian wells in, record of	52
shallow wells in	51
Double Bayou, wells at and near	31
Drainage, sketch of	2
Duval County, artesian wells in	33
shallow wells in	33

E.

Eagle Lake, wells near	39
East Bernard, artesian wells near	3
irrigation near	3
Echo, wells at and near	33
Edgewater, well at	29
Edna, wells near	16
El Campo, artesian wells near	3
irrigation near	3
Elevations, range of	2
Encinal, well at	53
Engle, wells near	39
Erin, wells at	24

F.

Falfurrias, wells near	8
Fayette County, artesian wells in	39
shallow wells in	39
Floresville, wells near	57
Fort Bend County, deep wells in	24
shallow wells in	24
Freestone County, artesian wells in	63
shallow wells in	63
Frio County, artesian wells in	54
shallow wells in	54
view of	1
Frio River, wells on	53

G.

	Page.
Galveston, water supply of	3
well at	27
record of	30
Galveston County, artesian wells in	27–30
artesian wells in, records of	28–30
shallow wells in	27
Galveston well, record of	12
Genoa, wells at and near	25
Gentry (Charles) well, record of	37–38
Geography, sketch of	1–2
Geology, sketch of	2
Gillis (John) ranch, well on	67
Goball, well at	41
Goliad, well near	34
Goliad County, artesian wells in	34
shallow wells in	34
Gonzales, well near, record of	37
Gonzales County, artesian wells in	35–38
artesian wells in, record of	37–38
shallow wells in	35
Grant, well near	60
Gregg County, artesian wells in	66
artesian wells in, record of	66
shallow wells in	66
Grimes County, artesian wells in	42
artesian wells in, record of	42
water of, analysis of	42
shallow wells in	42
Groveton, well at	63
Guadalupe County, artesian wells in	57
shallow wells in	57

H.

Hallettsville, wells at and near	38
Hampshire, wells near	31
Hardin County, artesian wells in	47–48
artesian wells in, records of	47, 48
water of, analyses of	47, 48
shallow wells in	47
Harris County, artesian wells in	24–27
artesian wells in, record of	26–27
shallow wells in	24
Harrisburg, well near	25
Harrison County, artesian wells in	67
artesian wells in, record of	67
shallow wells in	67
Hawkins, well near	67
Hawkinsville, well near	19
Hidalgo County, artesian wells in	7–8
artesian wells in, records of	7
water of, analysis of	8
shallow wells in	7
Hearne, wells near	58
Hempstead, wells at and near	41
Hitchcock, wells near	29
Hoskins Mound, well at, record of	23–24
Houston, water supply of	3, 25
wells at	24, 25
record of	26–27
Houston County, artesian wells in	63
shallow wells in	63
Humble, well at	25

I.

Page.

Inez, well near 16
Irrigation, use of 3

J.

Jackson County, artesian wells in 16–18
artesian wells in, records of 17–18
shallow wells in 16
Jasper County, artesian wells in 48–50
artesian wells in, records of 49–50
water of, analysis of 50
shallow wells in 48
Jefferson, well at 67
Jefferson County, artesian wells in 31–32
artesian well in, record of 32
shallow wells in 31

K.

Karnes City, well at 34
Karnes County, artesian wells in 34
shallow wells in 34
Katy, wells at 24
Kenard, wells near 63
Kenedy Pasture Company's wells, list of 4
Kemper, wells near 16
King ranch, wells on 5, 7, 10
wells on, water of, analysis of 12
Kirbyville, well at 48
well at, record of 50
water of, analysis of 50

L.

La Porte, wells at and near 25
Lasalle County, artesian wells in 53
shallow wells in 53
Lasater (E. C.) ranch, wells on 7
wells on, waters of, analyses of 8, 9
Laureles ranch, wells on 11
Lavaca County, artesian wells in 38
shallow wells in 38
League City, wells at 29
Lee County, artesian wells in 58
shallow wells in 58
Leesville, wells near 35–36
Leobau, well near 58
Leon Connty, artesian wells in 62
shallow wells in 62
Leon Springs, wells at 55
Liberty, wells at and near 43
Liberty County, artesian wells in 43–44
artesian wells in, records of 43, 44
water of, analyses of 43, 44
shallow wells in 43
Limestone County, artesian wells in 63
shallow wells in 63
Live Oak County, artesian wells in 34
shallow wells in 33
Location of region 1
Lockhart, wells near 57, 58
Longview, well at, record of 66

M.

McMullen County, artesian wells in 54
shallow wells in 53

Page.

Madison County, artesian wells in 62
shallow wells in 62
Manvel, well near 21
Marion County, artesian wells in 67
shallow wells in 67
Markham, well near 19
Marshall, well at 67
Martindale, wells near 57
Matagorda, well near 19
Matagorda County, artesian wells in 19
shallow wells in 19
Maverick County, artesian wells in 51
shallow wells in 51
Maxwell, wells near 57
Maysfield, well at 59
Meadow Brook County farms, wells on 24
Mesquite well, water of, analysis of 9
Midfield, well near 19
Miguel, wells near 54
Mikesha, well near 34
Milam County, artesian wells in 59
shallow wells in 59
Montgomery County, artesian wells in 44–46
artesian wells in, records of 44–46
water of, analyses of 45–46
shallow wells in 44
Morgan Point, wells at 25
Mount Belvieu, wells at and near 31
Myers, wells at and near 60

N.

Nacogdoches, wells near 64
Nacogdoches County, artesian wells in 64
shallow wells in 64
Navasota well, record of 42
water of, analysis of 42
Newton County, artesian wells in 50
shallow wells in 50
Nueces County, artesian wells in 9–13
artesian wells in, records of 10–12
waters of, analyses of 12–13
shallow wells in 9

O.

Oakhurst, well at 46
Oakville, wells at and near 34
O'Donnell (J. H.) farm, wells at 24
Orange, wells at and near 32–33
Orange County, artesian wells in 32–33
shallow wells in 32
Ovejas well, record of 6

P.

Palacios, wells at 19
Palestine, wells at 63
Panola County, artesian wells in 65
shallow wells in 65
Parker (Mit.) well, water of, analysis of 60
Pasadena, wells at 25
Pearsall, well near, view of 1
wells near 54

Page.

Pierce Station, well at, record of---- 20
Pittsbridge, wells at and near------ 60
Pleasanton, wells near---------- 55
Point Lavaca, wells near---------- 14
Polk County, artesian wells in----- 46
shallow wells in---------- 46
Port Arthur, well at---------- 31
Praha, wells at---------- 39

Q.

Quintana, well near---------- 21

R.

Rains County, artesian wells in---- 65
shallow wells in---------- 65
Rancho, wells near---------- 35–37
Refugio County, artesian wells in--- 13–14
shallow wells in---------- 13
Rice, irrigation for---------- 3
Richmond, water supply of---------- 24
well at---------- 24
Rio Grande embayment, wells in---- 3
wells in, plate showing------ 6
Rita, wells near---------- 60
Robertson County, artesian wells in- 58–59
shallow wells in---------- 58
Rusk County, artesian wells in----- 65
shallow wells in---------- 65

S.

Sabine County, artesian wells in--- 63–64
artesian wells in, record of----- 64
water of, analysis of------ 64
shallow wells in---------- 63
Sabine pass, well at---------- 31
well at, record of---------- 32
San Antonio, water supply of------ 3
wells at and near---------- 56
San Augustine County, artesian wells in---------- 63
shallow wells in---------- 63
San Jacinto County, artesian wells in---------- 46
shallow wells in---------- 46
San Miguel Creek, wells on---------- 54
San Patricio County, artesian wells in---------- 13
shallow wells in---------- 13
Sandy Point, well near---------- 21
Santa Clara well, record of---------- 12
Sauz ranch, wells at and near, records of---------- 5
Schulenburg, wells at---------- 39
Seabrook, wells at and near---------- 25
Seeligson ranch, wells on---------- 11
wells on, record of---------- 12
water of, analysis of------ 13
Seguin, well near---------- 57
Shelby County, artesian wells in---- 65
artesian wells in, record of---- 65
water of, analysis of------ 65
shallow wells in---------- 65
Shiner, wells at and near---------- 38

Page.

Silsbee, well at---------- 47
well at, record of---------- 47
water of, analysis of------ 47
Smith County, artesian wells in---- 66
shallow wells in---------- 66
Somerville, well near---------- 60
Starr County, artesian wells in----- 8–9
artesian wells in, water of, analysis of---------- 9
shallow wells in---------- 8
Steeles store, well near---------- 61
Stockdale, well near---------- 57
Stone City, well at and near---- 60, 61, 62
Stowell, well near---------- 31
Strange, wells at---------- 25
Streams, character of---------- 2
Stribling well, record of---------- 32
Sugar Land, wells near---------- 24
Sullivan (D.) ranch, wells on------ 7
Surfside, wells near---------- 21
Sutherland Springs, well near------ 57

T.

Tertiary rocks, occurrence of------- 2
Texas City, wells at---------- 29
Texas Land and Cattle Company's ranch, wells on------ 11
Thorndale, well at---------- 59
Tilden, wells at and near---------- 54
Topography, sketch of---------- 2
Trinity River, well at, record of---- 43
well at, water of, analysis of--- 43
Tunis, well near, water of, analysis of---------- 60
Tyler County, artesian wells in----- 48
shallow wells in---------- 48

U.

Underground water, description of, by counties---------- 3–67
Union, well near---------- 57
Upshur County, artesian wells in--- 67
shallow wells in---------- 67

V.

Van Zandt County, artesian wells in 65
shallow wells in---------- 65
Vanraub, wells near---------- 55
Velasco, wells near---------- 21
Victoria, well at and near---------- 16
Victoria County, artesian wells in-- 15–16
shallow wells in---------- 15
Votaw, well at---------- 47
well at, record of---------- 48
water of, analysis of------ 48

W.

Wadsworth, well near---------- 19
Walker County, artesian wells in---- 46
shallow wells in---------- 46
Waller County, artesian wells in---- 41

	Page.
Waller County, shallow wells in	41
Waller, well near	41
Wallisville, well at	31
Ward and Russell ranch, wells on	7
Washington, well at	41
Washington County, artesian wells in	41
shallow wells in	41
Water, underground, description of, by counties	3–67
importance of	2–3
Webb County, artesian wells in	51
shallow wells in	50
Webster, artesian wells near	3
irrigation near	3
wells at and near	25
Wells, artesian, flow of	3
location of, map showing	2
occurrence of	2–3
views of	4, 54
Wharton County, artesian wells in	19–21
artesian wells in, record of	20–21
shallow wells in	19
White Sulphur well, water of, analysis of	8
Whittaker, wells at and near	60
Wiess and Sanders ranch, wells on	48
wells on, records of	49–50
Wiess Bluff, well near	48
Wilson County, artesian wells in	57
shallow wells in	57
Wood County, artesian wells in	66
shallow wells in	66
Woodville, well near	48
Wooster, well near	25
Wrightsboro, wells near	35–36

Y.

Yoakum, well at	35
Yorktown, wells at	35

Z.

Zapata County, artesian wells in	33
shallow wells in	33
Zavalla County, artesian wells in	52
shallow wells in	52

CLASSIFICATION OF THE PUBLICATIONS OF THE UNITED STATES GEOLOGICAL SURVEY.

[Water-Supply Paper No. 190.]

The publications of the United States Geological Survey consist of (1) Annual Reports, (2) Monographs, (3) Professional Papers, (4) Bulletins, (5) Mineral Resources, (6) Water-Supply and Irrigation Papers, (7) Topographic Atlas of United States—folios and separate sheets thereof, (8) Geologic Atlas of United States—folios thereof. The classes numbered 2, 7, and 8 are sold at cost of publication; the others are distributed free. A circular giving complete lists can be had on application.

Most of the above publications can be obtained or consulted in the following ways:

1. A limited number are delivered to the Director of the Survey, from whom they can be obtained, free of charge (except classes 2, 7, and 8), on application.

2. A certain number are delivered to Senators and Representatives in Congress for distribution.

3. Other copies are deposited with the Superintendent of Documents, Washington, D. C., from whom they can be had at prices slightly above cost.

4. Copies of all Government publications are furnished to the principal public libraries in the large cities throughout the United States, where they can be consulted by those interested.

The Professional Papers, Bulletins, and Water-Supply Papers treat of a variety of subjects, and the total number issued is large. They have therefore been classified into the following series: A, Economic geology; B, Descriptive geology; C, Systematic geology and paleontology; D, Petrography and mineralogy; E, Chemistry and physics; F, Geography; G, Miscellaneous; H, Forestry; I, Irrigation; J, Water storage; K, Pumping water; L, Quality of water; M, General hydrographic investigations; N, Water power; O, Underground waters; P, Hydrographic progress reports. This paper is the sixty-seventh in Series O, the complete list of which follows: (PP= Professional Paper; B=Bulletin; WS=Water-Supply Paper):

SERIES O, UNDERGROUND WATERS.

WS 4. A reconnaissance in southeastern Washington, by I. C. Russell. 1897. 96 pp., 7 pls. (Out of stock.)

WS 6. Underground waters of southwestern Kansas, by Erasmus Haworth. 1897. 65 pp., 12 pls. (Out of stock.)

WS 7. Seepage waters of northern Utah, by Samuel Fortier. 1897. 50 pp., 3 pls. (Out of stock.)

WS 12. Underground waters of southeastern Nebraska, by N. H. Darton. 1898. 56 pp., 21 pls. (Out of stock.)

WS 21. Wells of northern Indiana, by Frank Leverett. 1899. 82 pp., 2 pls. (Out of stock.)

WS 26. Wells of southern Indiana (continuation of No. 21), by Frank Leverett. 1899. 64 pp. (Out of stock.)

WS 30. Water resources of the Lower Peninsula of Michigan, by A. C. Lane. 1899. 97 pp., 7 pls. (Out of stock.)

WS 31. Lower Michigan mineral waters, by A. C. Lane. 1899. 97 pp., 4 pls. (Out of stock.)

WS 34. Geology and water resources of a portion of southeastern South Dakota, by J. E. Todd. 1900. 34 pp., 19 pls.

WS 53. Geology and water resources of Nez Perces County, Idaho, Pt. I, by I. C. Russell. 1901. 86 pp., 10 pls. (Out of stock.)

WS 54. Geology and water resources of Nez Perces County, Idaho, Pt. II, by I. C. Russell. 1901. 87–141 pp. (Out of stock.)

WS 55. Geology and water resources of a portion of Yakima County, Wash., by G. O. Smith. 1901. 68 pp., 7 pls. (Out of stock.)
WS 57. Preliminary list of deep borings in the United States, Pt. I, by N. H. Darton. 1902. 60 pp. (Out of stock.)
WS 59. Development and application of water in southern California, Pt. I, by J. B. Lippincott. 1902. 95 pp., II pls. (Out of stock.)
WS 60. Development and application of water in southern California, Pt. II, by J. B. Lippincott. 1902. 96–140 pp. (Out of stock.)
WS 61. Preliminary list of deep borings in the United States, Pt. II, by N. H. Darton. 1902. 67 pp. (Out of stock.)
WS 67. The motions of underground waters, by C. S. Slichter. 1902. 106 pp., 8 pls. (Out of stock.)
B 199. Geology and water resources of the Snake River Plains of Idaho, by I. C. Russell. 1902. 192 pp., 25 pls.
WS 77. Water resources of Molokai, Hawaiian Islands, by Waldemar Lindgren. 1903. 62 pp., 4 pls.
WS 78. Preliminary report on artesian basins in southwestern Idaho and southeastern Oregon, by I. C. Russell. 1903. 53 pp., 2 pls.
PP 17. Preliminary report on the geology and water resources of Nebraska west of the one hundred and third meridian by N. H. Darton. 1903. 69 pp., 43 pls.
WS 90. Geology and water resources of a part of the lower James River Valley, South Dakota, by J. E. Todd and C. M. Hall. 1904. 47 pp., 23 pls.
WS 101. Underground waters of southern Louisiana, by G. D. Harris, with discussions of their uses for water supplies and for rice irrigation, by M. L. Fuller. 1904. 98 pp., 11 pls.
WS 102. Contributions to the hydrology of eastern United States, 1903, by M. L. Fuller. 1904. 522 pp.
WS 104. Underground waters of Gila Valley, Arizona, by W. T. Lee. 1904. 71 pp., 5 pls.
WS 106. Water resources of the Philadelphia district, by Florence Bascom. 1904. 75 pp., 4 pls.
WS 110. Contributions to the hydrology of eastern United States, 1904; M. L. Fuller, geologist in charge. 1904. 211 pp., 5 pls.
PP 32. Geology and underground water resources of the central Great Plains, by N. H. Darton. 1904. 433 pp., 72 pls. (Out of stock.)
WS 111. Preliminary report on underground waters of Washington, by Henry Landes. 1904. 85 pp., 1 pl.
WS 112. Underflow tests in the drainage basin of Los Angeles River, by Homer Hamlin. 1904. 55 pp., 7 pls.
WS 114. Underground waters of eastern United States, by M. L. Fuller, geologist in charge. 1904. 285 pp., 18 pls.
WS 118. Geology and water resources of east-central Washington, by F. C. Calkins. 1905. 96 pp., 4 pls.
B 252. Preliminary report on the geology and water resources of central Oregon, by I. C. Russell. 1905. 138 pp., 24 pls.
WS 120. Bibliographic review and index of papers relating to underground waters published by the United States Geological Survey, 1879–1904, by M. L. Fuller. 1905. 128 pp.
WS 122. Relation of the law to underground waters, by D. W. Johnson. 1905. 55 pp.
WS 123. Geology and underground water conditions of the Jornada del Muerto, New Mexico, by C. R. Keyes. 1905. 42 pp. 9 pls.
WS 136. Undergroundwaters of the Salt River Valley, by W. T. Lee. 1905. 194 pp., 24 pls.
B 264. Record of deep-well drilling for 1904, by M. L. Fuller, E. F. Lines, and A. C. Veatch. 1905. 106 pp.
PP 44. Underground water resources of Long Island, New York, by A. C. Veatch and others. 1905. 394 pp., 34 pls.
WS 137. Development of underground waters in the eastern coastal plain region of southern California, by W. C. Mendenhall. 1905. 140 pp., 7 pls.
WS 138. Development of underground waters in the central coastal plain region of southern California, by W. C. Mendenhall. 1905. 162 pp., 5 pls.
WS 139. Development of underground waters in the western coastal plain region of southern California, by W. C. Mendenhall. 1905. 105 pp., 7 pls.
WS 140. Field menasrements of tbe rate of movemen of underground waters, by C. S. Slichter. 1905. 122 pp., 15 pls.
WS 141. Observations on the ground waters of Rio Grande Valley, by C. S. Slichter. 1905. 83 pp., 5 pls.
WS 142. Hydrology of San Bernardino Valley, California, by W. C. Mendenhall. 1905. 124 pp., 13 pls.
W 145. Contributions to the hydrology of eastern United States; M. L. Fuller, geologist in charge. 1905. 220 pp., 6 pls.
WS 148. Geology and water resources of Oklahoma, by C. N. Gould. 1905. 178 pp., 22 pls.
WS 149. Preliminary list of deep borings in the United States, second edition, with additions, by N. H. Darton. 1905. 175 pp.
PP 46. Geology and underground water resources of northern Louisiana and southern Arkansas, by A. C. Veatch. 1906. 422 pp., 51 pls.
WS 153. The underflow in Arkansas Valley in western Kansas, by C. S. Slichter. 1906. 90 pp., 3 pls.

WS 154. The geology and water resources of the eastern portion of the Panhandle of Texas, by C. N. Gould. 1906. 64 pp., 15 pls.
WS 155. Fluctuations of the water level in wells, with special reference to Long Island, New York, by A. C. Veatch. 1906. 83 pp., 9 pls.
WS 157. Underground water in the valleys of Utah Lake and Jordan River, Utah, by G. B. Richardson. 1906. 81 pp., 9 pls.
WS 158. Preliminary report on the geology and underground waters of the Roswell artesian area, New Mexico, by C. A Fisher. 1906. 29 pp., 9 pls.
PP 52. Geology and underground waters of the Arkansas Valley in eastern Colorado, by N. H. Darton. 1906. 90 pp., 28 pls.
WS 159. Summary of underground-water resources of Mississippi, by A. F. Crider and L. C. Johnson. 1906. 86 pp., 6 pls.
PP 53. Geology and water resources of the Bighorn basin, Wyoming, by C. A. Fisher. 1906. 72 pp., 16 pls.
WS 160. Underground-water papers, 1906, by M. L. Fuller. 1906. 104 pp., 1 pl. (Out of stock.)
WS 163. Bibliographic review and index of underground-water literature published in the United States in 1905, by M. L. Fuller, F. G. Clapp, and B. L. Johnson. 1906. 130 pp.
WS 164. Underground waters of Tennessee and Kentucky west of Tennessee River and of an adjacent area in Illinois, by L. C. Glenn. 1906. 173 pp., 7 pls.
WS 181. Geology and water resources of Owens Valley, California, by W. T. Lee. 1906. 28 pp., 6 pls. (Out of stock.)
WS 182. Flowing wells and municipal water supplies in the southern portion of the Southern Peninsula of Michigan, by Frank Leverett and others. 1906. 292 pp., 5 pls.
WS 183. Flowing wells and municipal water supplies in the middle and northern portions of the Southern Peninsula of Michigan, by Frank Leverett and others. 1906. 393 pp., 5 pls.
B 298. Record of deep-well drilling for 1905, by M. L. Fuller and Samuel Sanford. 1906. 299 pp.
WS 184. The underflow of the South Platte Valley, by C. S. Slichter and H. C. Wolff. 1906. 42 pp.
WS 188. Water resources of the Rio Grande Valley in New Mexico and their development, by W. T. Lee. 1906. 59 pp., 10 pls.
WS 190. Underground waters of Coastal Plain of Texas, by T. U. Taylor. 1907. 73 pp., 3 pls.

The following papers also relate to this subject: Underground waters of Arkansas Valley in eastern Colorado, by G. K. Gilbert, in Seventeenth Annual, Pt. II; Preliminary report on artesian waters of a portion of the Dakotas, by N. H. Darton, in Seventeenth Annual, Pt. II; Water resources of Illinois, by Frank Leverett, in Seventeenth Annual, Pt. II; Water resources of Indiana and Ohio, by Frank Leverett, in Eighteenth Annual, Pt. IV; New developments in well boring and irrigation in eastern South Dakota, by N. H. Darton, in Eighteenth Annual, Pt. IV; Rock waters of Ohio, by Edward Orton, in Nineteenth Annual, Pt. IV; Artesian-well prospects in the Atlantic coastal plain region, by N. H. Darton, Bulletin No. 138.

Correspondence should be addressed to

The Director,
United States Geological Survey,
Washington, D. C.

April, 1907.

O

IRR 190—07——6

LB Je '08

LIBRARY OF CONGRESS
0 019 953 680 1